

20-9-0  
An Arithmetical Militare Treatise, named  
**STRATIOTICOS:**

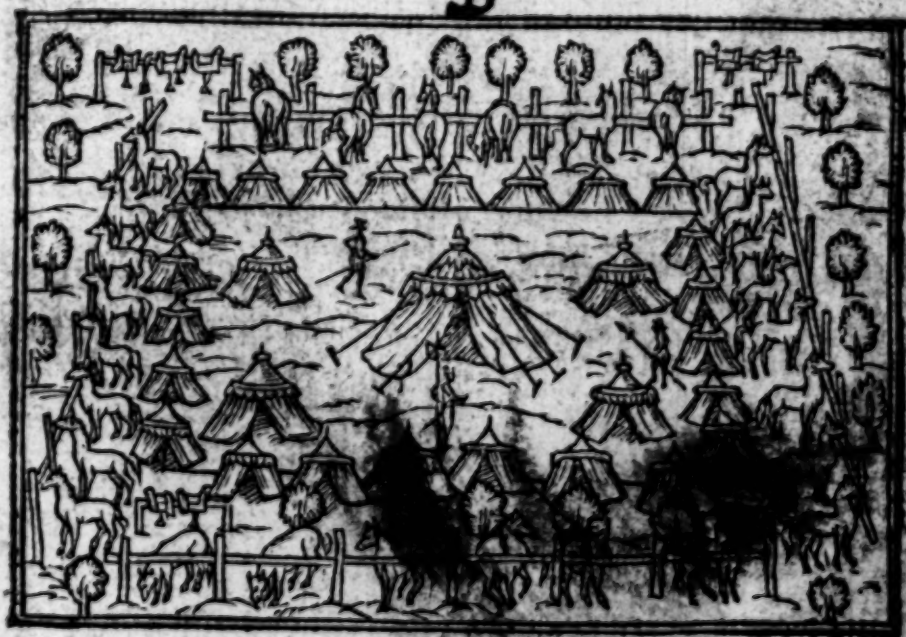
*Compendiously teaching the Science of Nũbers,*  
as vvell in Fractions as Integers, and so much of the Ru-  
les and Æquations Algebraicall and Arte of Numbers  
Cossicall, as are requisite for the Profession of a Soldiour.

Together with the Moderne Militare Discipline, Offices, Lawes and  
Ducties in euery wel gouerned Campe and Armie to be obserued:

Long since attēpted by LEONARD DIGGES Gentleman,  
Augmented, digested, and lately finished, by  
THOMAS DIGGES, his Sonne.

*Whereto he hath also adioyned certaine Questions of great Ordinaunce,  
resolved in his other Treatize of Pyrotechny and greas  
Artillerie, hereafter to bee published.*

VIVET POST FVNERA VIRTVS.



AT LONDON:  
Printed by Henrie Bynneman.  
*Anno Domini. 1579.*





¶ To the Right Honourable my singular good Lord, the Lorde Robert Dudley, Earle of *Leicester*, Baron of *Denbigh*, Knighte of the most noble order of the Garter, and one of his *Maiesties* most Honourable private Counsaile.



Ighte Honourable, finding my selfe to youre Lordship deeply bounde, as well for my preferment to his *Maiesties* seruice, as for sundrie other fauours continuallye powred on me, I haue carefullye be-thought my selfe, whyche way I mighte render some testimonye of a gratefull minde. And hauing spent many of my yeares in reducing the Sciences *Mathematicall*, from *Demonstratiue Contemplations*, to *Experimentall Actions*, for the seruice of my Prince and Countrey: (beeyng thereto greatly ayded by the *Practises*, *Observations*, *Monuments*, and *Conferences* of my Father, with the rarest Souldyours of his time) haue among sundrie other discourses of *Nauigation*, of *Fortification*, of *Pyrotechnie*, and great *Artillerie*, long sithence comenced, latelie finished this *Arithmeticall Treatise*, wholly applyed to *Militare* affayres. And finding not onely by the whole course of *Histories* of all times and Countreys, howe *Kingdomes* haue flourished in all felicitie, whereas this Arte hath bene embraced, and duely practised, and contrarywise, how most happie *Empires* after warlike *Discipline* haue bin corrupted, haue fallen to ruine, and miserable seruitude: but also by experience euen in these dayes seene, what extreame disorders growe in those *Armies*, where *Militare*

A.ij.

Laver

## The Epistle Dedicatorie.

*Lawes*, and *Ordinances*, haue bene neglected: haue thought this matter not vnfit to be remembred in these our flourishing and quiet times, that as the *Pallace* of this most happie *Kingdome*, (ruled by a Souerayne *Princesse*, whose wisdom and rare vertues all *Europe* haue in admiration) is inwardlye most curiouslye garnished with the perfection of *Sciences* Humane and Diuine, with sundry *Artes*, with Riches, Rest, Wealth, and Pleasure comparable with, or surpassing anye other of Christendome: so wishing also it maye not want (when need shall be) the *Roofe*, and outward couering, to defend and garde it from the winde and Rayne, and furious stormes of Forraigne *Tempestes*. And as the Fame of an honourable enterprise, vnder your Lordships conduite generally expected, did first moue me to employ my *Mathematicall Muscs*, vpon this *Militare Argument*, so sithence hauing in some poynts altered, and augmented the first *Originall*, to your Lordship then presented, and now fully digested and finished the same, (wel knowing the *Methode* suche, as hitherto in no Language hath bin published, and your Lordship for Wisdom, Learning, and *Experience*, (hauing long sithence borne honourable Office in the Field) fullie able of your selfe to discerne the *Veritie* and *Valour* of this Worke.) In discharge of some part of my dutie, I presume to present, and publish the same vnder the *Protection* of your Name. As a *Patrone*, I aduow my selfe to honor, by all other due dutifull meanes I can. And crauing fauourable acceptation of this my homelie dutifull present, humbly leaue your Lordship to the direction of the *Almightie*, who graunt you a long prosperous life, garnished with cōtinuall encrease of honourable actions, to the amplyfying of his Glorie and true *Religion*, the faithfull seruice of hir most excellent *Maieſtie*, and comfort of vs all that loue and honour you.

Your Honours dutifully at command.

THOMAS DIGGES.



# THE PREFACE to the Reader.



Auing spent my youngest yeres euen from my Cradle in the Sciences Liberal, & especially in searching the most difficult & curious Demonstrations Mathematicall, by pꝛofe at last I found the saying of that wise Tarentine & eloquent Romane most true: That if it wer possible foꝛ a mortall man by power Diuine to bee

fransferred into some solitarie Garden of incomparable pleasure, and there all things that could be wished as it were by the hands of Angels to be ministred vnto him, enioying perfect Health, Strength, and all other good giftes of Nature, that were requisite to a full perfection of delite both in minde and body, saue onely that it should not be lawfull foꝛ him to haue Societie oꝛ cōference with any man to communicate the state of his Felicitie: That notwithstanding all these delites, his life should seeme tedious, and all these pleasures loathsome.

Euen so, albeit the strange varietie of Inuentions in the more subtile part of these Mathematical Demonstrations did bꝛeede in me foꝛ a time a singular delectation, yet finding none, oꝛ very few, with whome to conferre & communicate those my delites, (& remembꝛing also that graue sentence of Diuine Plato, that we are not boꝛne foꝛ our selues, but also foꝛ our Parents, Countrie, and

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Friends.) After I grew to yeares of riper iudgement, I haue wholly bent my self to reduce those Imaginative Cōtemplations, to sensible Practicall Conclusions: as well thereby to haue some companions of those my delectable studies, as also to be able, when time is, to employ the to the seruice of my Prince and Countrie.

First therefore, by Demonstrations Mathematical finding the great imperfections in the Arte of Nauigation, & grosse Errours practised by the masters and Mariners of this our age, I sought by reason to perswade with some of them to alter & refozme their Charts, Instruments, and erroneous Rules, shewing them infallible Demonstrations of their Errours.

In lyke sort, perusing the Auntient Romane Discipline for the Warres, their exquisite order of Trayning the Soldiorie euen from their infancie, in sundry sorts of hardenesse, Labour and Actiuitie: Their inuincible order in Marching, Fighting, and Encamping, together with their diuine Lawes to keepe their Armies in obedience. Finding also by conferring the Romane Histories, how afterwards by the dissolute disorder of Emperours this Discipline was corrupted, & Romane People disarmed, a Pretorian Garde maintained, which licenciously liuing, murdered & deposed the Emperours theselues, & solde the Empire for money to whom they list: And so by little and little & Maiestie of that Monarchie defaced, & the Romane People which before gaue Lawes to & world afterward most seruilely to abide, not onely all kinde of iniurie and villanie among themselues, but also inuaded, spoyled, sacked and conquered by the Hunes, Vandalles, Gothes, and other barbarous Nations.

The whole course of these Histories conferred with the rising and falling also of the Assirian, Persian and Macedonian Monarchies, did plainely demonstrate vnto mee, that the well and euill vsing of this Militarie Discipline



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pline among all naturall causes was the greatest, or rather the onely occasion, of the aduancing, establishing, or razing and defacing of all Monarchies, Empires, Kingdomes, & Common Weales. And haue therefore with sundry Captaines conferred, and earnestly perswaded, that as in all other Artes and Sciences we ayde our selues w<sup>th</sup> Precedents from Antiquitie, so in this Arte of Discipline Militaire, so corrupted, or rather vtterly extinguished, we should repaire to those Fountaines of perfection, and accomodate them to the seruice of our Time.

But as among many with whome I haue conferred, aswell of mine owne Countrimen, as Straungers, albeit I found some one or other of the better learned and best experienced, that ioyned with me in opinion, yet generally (such is the imperfection of mans nature) if they had bene in a few skirmishes, or taken any degree in fildes, they thought it so great a disgrace, that any thing should be desired in a Souldiour that wanted in themselves, that presentlie they woulde giue their Definitive Sentence, that the Time was chaunged, the Warres were altered, and the furie of Ordinaunce suche, as all those Romane Orders were meere toys once to be talked of in these oure dayes: As though the Heauens and Elementes had chaunged their Natures, or Men and Weapons so altered, as no humaine reason might attaine to consider the difference. Or as though the Romane Orders for y<sup>e</sup> fild (a very few excepted) were not more cōuenient, more seruiceable, and more Inuincible, (all alterations considered) euen in these our dayes, than they were for that age wherein they were used and practized.

In like sort by Malters, Pilotes, and Mariners, I haue bene aunswered, that my Demonstrations were pretie deuises: but if I had bene in any Sea seruices, I should finde all these my Inuentions meere toys, & their Rules onely practizeable: Adding farther, that whatsoeuer I  
could

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could in Paper by Demonstrations perswade, by Experience on Seas they found their Charts and Instruments true and infallible.

These constant asseuerations from men of that Profession, euen in their owne Arte, did make me halfe distrust my Demonstrations, and to thinke that Reason had abused me, or that there were some such Misterie in Sea seruice, as no Land mans reason might attaine vnto.

To resolue my selfe of this Paradoxe, I spent a xv. weekes in continual Sea seruices vpon the Ocean, where by proue I found, and those verie Masters themselues could not but confesse, that Experience did no lesse plainly discouer the Errours of their Rules, than my Demonstrations. Sithens which time, I haue learned no more to be abused with the Opinions of men, what Office, or Degrée soeuer they haue boꝝn, or what Fame soeuer go of them, if Reason be repugnant to their Opinions. For

*Magni sapè Viri, mendacia magna loquuntur :*

*Ratio dux fida Sophorum.*

And Reason teacheth me, how barbarous that common opinion is, that an English man will be trained in a few weekes to be a perfect Souldiour. For if a Mason, a Painter, or other Mechanicall Artificer be scarcely able in seuen yeares to learne the perfection of his Science, shal we thinke the Art of a Souldiour so base and abiect, that it is to be attained in a few weekes or monethes? But such is the Vanitie of the common sort, that if they haue caried Armes, and bene in a few seruices, they presently thinke themselues worthy the name of perfect Souldiours.

Pet Guillaume du Bellay, Seigneur de Langeay, a famous General of our age, hauing set down a great number of parts requisite in a trained Souldiour, and also in a trained Band. concludeth with this resolution: That such a Souldiour or Band, as is able Encamping, Marching,  
and



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and Fighting, to execute all those his prescribed orders, albeit he neuer saw the Enemie in the face, yet I holde hym (sayth that Generall) an olde Souldioure, or a trayned Bande. And otherwise, if he haue bin neuer so long in the Warres, yea if it were possible for him to be in a thousand Seruices, if he be not able to persourne those Orders, I account of him but as of a raw vntrayned Souldioure.

But seeing it woulde require at the least an whole age, and the direction of some rare Prince to reduce Souldiorie to the antique perfection, and therefore in wayne for any priuate man to intermedle therewithall: yet somewhat to discouer that grosse Errour, that Souldiarie maye so sone be learned, and that we may haue some tast and feeling at least of oure owne ignorance and imperfection, and to awake our Nation out of that secure Dreame, hauing partly by experience my selfe scene, what extreame disorders growe, and dishonours are receyued for wante of Militare Discipline: I haue therefore thought good, according to the best obseruations of oure Moderne Warres, and Service of this Time, to sette downe the Office and dutie of eache person and calling, passing from a Priuate Souldiour, to a Generall, with certayne Militare Lawes to be obserued in euery well gouerned Armie.

And albeit I well knowe, these matters Militare, (not being Mathematicall, and therefore not to be confirmed by inuincible Demonstration, but as Philosophie, Lawe, Physicke, and suche other Artes, standing on probabilitie onelie) may and will in many opinions be impugned, yet hauing discourse of Reason, with Authoritie, and Example, not only from Antiquitie, but also of the most notable and famous Souldiours of our Age in Christendome, as well in their priuate as publike Actions, to confirme and ratifie these orders and Discipline by me deliuered, I am in the better hope, the wise, and best experienced, will not mislike my Trauels, tending chieflie to this ende, that

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our Nation in thys happye peace maye not rest altogether carelesse of Warres, but in suche sorte prepare theyr Myndes and Bodyes, that when neede shall be, they may be found the more readie, and capable of orders Millitare, which do so well conforme with Ciuill and peaceable gouernement, as nothing more.

Howbeit, the corruption of Millitare Discipline, and licentious liuing of the Souldyoure of oure tyme, hath made them odious, who of all other shoulde most be embraced and loued, if these Errours were reformed, and this their Arte duly practised.

For who ought to be a greater louer of Peace than he? who chiefelie in Warres is to endure Payne, Perill, Hunger, Cold, and infinite other diseases.

Who ought to be more saythfull to hys Prince, and Countrey, than he? whose Oth and profession is to Sacrifice himselfe for the same.

In whome ought there to be a greater loue and feare of God than in him: that euerie day committing himselfe to a thousande dangers and hazardes of life, hath the most neede of his ayde and helpe.

These things considered of the Founders of the most honourable Kingdomes and Monarchyes of the Worlde, did cause them by all meanes to embrace this Arte, and together with Artes Ciuill, to trayne theyr Subiectes in this Science Militare, as heereafter more particularly I shall haue cause to declare, hauing in this discourse no farther relyed vpon the Discipline of the Antiquitie, than by Reason, Example, and Authoritie of the most famous Generals and Souldyoures of thys Age in Christendome, I haue founde necessarie to dissent from suche brute customs as the Barbarous Gothes, &c. left vs, and oure delicious yole ignorance hath still nourished among vs, embracing all such Moderne Ordinances and vsances, as are not quite repugnante to all good Discipline,  
and



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and by no meanes to be allowed or tollerated.

The whole Treatise I haue deuised into three Bookes. The firste Booke compendiously declareth the five vulgare Arithmeticall kyndes, with the extraction of the Rootes Quadrate, and Cubicall, in whole numbers, and also in Fractions. Thys was begon, and almost finished by my Father.

In the second Booke I haue taught the same kinds in numbers Cossicall, with so much of the Arte of Algebra, as I fynde necessarie for a Souldioure, and thereto adioyned sundrie Questions in diuers of the principall Offices of the Field.

And bycause suche Noblemen or Gentlemen as wyll applye themselves to that honourable profession, maye know how in manye other Seruices Militaire Arithmetike maye stande them in steede, I haue added the thirde Booke of Militaire Lawes, Offices, and Duties.

Last of all I haue set downe certayne Questions touching greate Ordinance, to be considered, and resolved of suche as haue the perfection of the Arte of manedging Great Artillerie, giuing also vnto suche as are or will be practizers therein, some light, howe to directe the order of their Practises. And if they be founde of that difficultie that none will undertake to meddle with theyr resolution (as I see these my Laboures gratefully accepted) I wyll imparte wyth my Countreyemen my Treatise of Greate Artillerie and Pyrotechnie, deliuering the same wyth sundry rare seruiceable secretes, hytherto not put in execution by anye Christian Prince.

Otherwise, by the example of my Father, Pythagoricallye I wyll contente my selfe Per manus tradere, and to communicate them onely wyth a fewe selecte friendes.

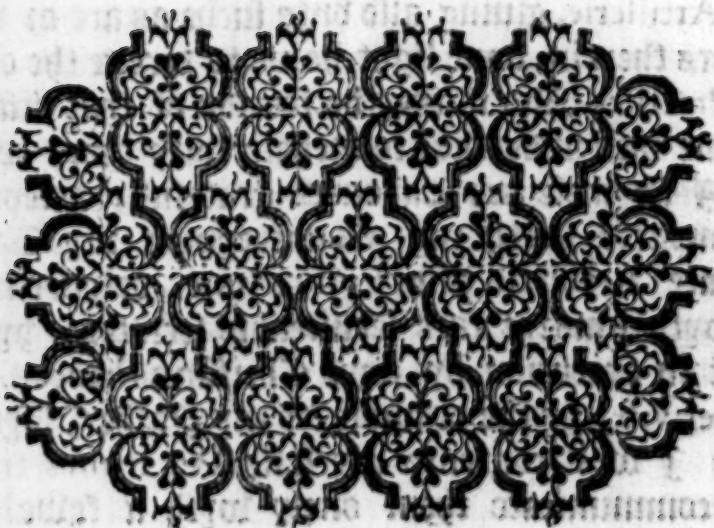
## To the Reader.

And so good Reader I committe thee to the Treatise it  
selfe, wherein if thou finde any thing that dothe contente  
thee, yeelde due thanks to the Patrone of the Worke,  
whose honourable disposition in fauouring and aduanc-  
ing all Vertue, and chieselie the studious of these Li-  
berall Sciences, with many especiall fauours bp-  
pon my selfe, hath prouoked, or rather in-  
forced me, to take in hande this  
presente Worke, finished  
the 13. of October.

1579.

VNI DEO, PATRIAE, PATRIAEQVE  
PATRONAE.

THOMAS DIGGES.





# The Contentes of this Treatise briefly ensue.

## The first Booke Arithmetically.

Numeration.	Chap. 1	Of Integers Abstract.	Nomination.	Chap. 11	Of Fractions.
Addition.	Chap. 2		Reduction.	Chap. 12	
Subtraction.	Chap. 3		Abreniation.	Chap. 13	
Multiplication.	Chap. 4		Addition.	Chap. 14	
Division.	Chap. 5		Subduction.	Chap. 15	
Reduction.	Chap. 6		Multiplication.	Chap. 16	
Progression.	Chap. 7		Partition.	Chap. 17	
Quadrat Radix.	Chap. 8		Roote Square.	Chap. 18	
Radix Cubicall.	Chap. 9		Roote Cubicall.	Chap. 19	
Proofof the Pre. Ca.	10				

Rules of Proportion. Chap. 20.

{ Directe.  
Innerfed.  
Doubled.

## The seconde Booke Algebraicall.

{ Explication of Numbers.	{ Chap. 1.	
{ Cossicall in new Charecters.		
{ Addition.	{ Of Integers Denominate or Cossicall.	Chap. 2.
{ Subduction.		Chap. 3.
{ Multiplication.		Chap. 4.
{ Partition.		Chap. 5.
{ Of Fractions Cossicall.	{ Chap. 5.	
{ Integers.	{ Denominate.	Chap. 7.
{ Fractions.		
{ Equations.		
{ The Rule of Coss.	{ Chap. 8.	
{ Invention of Quadrates or	{ Chap. 9.	
{ second Rootes in 5. Rules.		
{ Questions touching the Office of the Sergeant	{ Arithmetically resolved.	Chap. 10.
{ Maior.		
{ Questions of the High Marshall his Office:		Chap. 11.
{ or Camp Mayster.		
{ Questions concerning the Office of the Mayster of the Ordinance.		Chap. 12.
{ Questions concerning the Treasurer, the Mayster of the Victuals, and Captaine of the Pioners.	Chap. 13.	

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## The third Militare, conteyning Offices, Lawes, Stratagemes, &c.

{ The Office of a private Souldiour.	C. p. I.
{ The Office of a Corporall.	Chap. 2.
{ The Office of a Serieant of a Band.	Chap. 3.
{ The Office of the Ensigne bearer.	Chap. 4.
{ The Office of a Lieutenant.	Chap. 5.
{ The Office of a Captayne.	Chap. 6.
{ The Office of a Coronell.	Chap. 7.
{ The Office of the Scoutemayster.	Chap. 8.
{ The Office of a Serieant Generall.	Chap. 9.
{ The Office of a Generall or Lieutenant of Horsemen.	Chap. 10.
{ The Office of a Mayster of the Ordinance, &c.	Chap. 11.
{ The Office of the Lord high Marshall, &c.	Chap. 12.
{ Discipline Militare of the Prince of Conde, & Admiral.	Ca. 13.
{ The high Treasurers Office, &c.	Chap. 14.
{ Of the Generall, his person, office, &c. with Stratagemes.	Cap. 15.
{ The Description of a Camp well ordered and fortified.	Chap. 16.
{ The Portrayte of a Battell in order to fight.	Chap. 17.
{ Questions of great Ordinance.	

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## The Bookes already published by the Authoure of thys Treatise.

**A** Generall Pronostication long sithence published by his Father, after perused by hymselfe, and thereto adioyned the frame of the Worlde, according to *Copernicus Hypothesis*, vpon the mobilitie of the Earth.

A Geometricall Treatise called *Pantometria*, begon by hys Father, augmented and finished by hymselfe.

A Booke in Latine entituled *Ala, seu Scala Mathematica*, deliue.



deliuering fundrye Demonstrations, for the finding of the *Paralaxis* of any Comet, or other Celestiall bodie, wyth the correction of the Erroures in the vse of *Radus Astronomicus*.

This present Arithmeticall *STRATIOTICOS*, de-  
uided into three Bookes.

Bookes begun by the Author,  
heereafter to be published.

1 **A** *Treatise of the Arte of Navigation*, bewraying the grosse *Erroures* by oure Maysters, and Marriners practised; deliuering new Rules, and *Instruments* infallible, and practiceable, some also accommodate to the vulgare Capacitie, with a discourse *Demonstratiue*, vpon sundry *Hypotheses* of the *Nauticall Compasse* hys *Variation*, discovering Rules for the inuention of the *Longitude* at all tymes to bee practised, as certayne as by the ☉ *Eclipses*.

2 A brieft *Treatise of Architecture Nauticall*, wherein is deliuered *Rules* infallible vpon anye one forme or Modell of *Excellencie* founde, to buylde Shyppes for all burthens of lyke perfection and propertie to the *Patterne*, wyth certayne kyndes of forcible fyghtes, Lawes, also and Orders in Sea seruices to be obserued.

3 *Commentaries vpon the Revolutions of Copernicus*, by euidente Demonstrations grounded vpon late *Observations*, to ratifye and confirme hys *Theorikes* and *Hypothesis*, wherein also *Demonstratiue* shall be discussed, whether it bee possible vpon the vulgare *Thesis* of the Earthes *Stabilitie*, to delyuer any true *Theorike* voyde of such irregular Motions, and other absurdities, as repugne the whole *Principles of Philosophie* naturall, and apparant groundes of common Reason.

4 A Booke of Dialling, teaching the Arte to garnish all the *Regular* and transformed bodyes, in his *Pansometria*-  
ment-

mentioned, with houres vulgare and Planetare, Signes, Azimuthes, Almucanters &c. and also to make all sortes of Dials, Annulare, Cylinders, Nauicles, Hydriacles. &c.

5 *A Treatise of Great Artillerie, and Pyrotechnie, conteyning fundrie Demonstrations Geometricall, and Instruments exactly to shoote in all sortes of Peeces at all degrees of Ransons, both by day and night, with other new Inuentions, and seruiceable secretes, begon by his Father after long Experience, augmented, and heereafter to be finished by himselfe.*

6 *A Treatise of Fortification of Townes, Fortes, and Campes, by a Methode cleane repugnant to anye hitherto practised, conteyning fundrie sorts of more forcible formes, with Rules of great facilitie by certayne Instruments Geometricall to stake them out, and readilie to set downe in good order an whole Armie, with all his Regiments, Footemen, Horsemen, Munition, Carriadges, &c. in most commodious and strong maner that place will permitte.*

*All these and other long sithens, the Author had finished and published, had not the Infernall Furies, enuying such his Foelicitie, and happie Societie with his Mathematicall Muses, for many yeares so tormented him with Lawe-  
Brables, that he hath bene enforced to discontinue those his delectable Studies,*

*To implore in Ayde from Iupiters Pallace,  
PHILORTHVS PHILARETES and  
PHILOMATHES*

*Against  
APLESTODOLEROS. AMOVSEOS  
MISOGENAIOS.*

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DABIT DEVS HIS QVOQVE FINEM.



¶ The kindes of *Algorisme*, whiche I  
intend briefly to treat of, as vvell in bro-  
ken as whole, are these, *Numeration*, *Addition*,  
*Subtraction*, *Multiplication*, *Partition*,  
*Reduction*, *Progreſſion*, with the fin-  
ding of the *Rootes*, *Square*,  
and *Cubicall*.

## The first Booke.

### Of Numeration. Chap. I.



Number is the multitude of Unités sette  
together, as 2. 3. 4. &c. All Numbers may  
be expressed by these Characters follo-  
wing.

1 2 3 4 5 6 7 8 9 0

Whose simple value by themselves con-  
sidered, you maye here vnder beholde.

i ii iii iiii v vi vii viii ix 0

The Ciphra 0 augmenteth places, but of himselfe signi-  
fieth not. To number anye summe nothing else it is, but to  
declare the value of everie Figure placed. So many places  
are in your worke, as there be Elementes from the righte  
hand to the left. Every Figure in the first place betokeneth  
himselfe, and so towarde the left side, tenns times so muche  
as he was the place before.

### Example.

The value of the figures placed.

0 0

0 0 0 0 0

C M C M C M C M one

The last. 1 1 1 1 1 1 1 1 1 The first place.

15.

15.

To auoyde confusion, and to attayne quicke and readie numbring. In greate numbers handle your summe thus. The fourth place whiche representeth a  $\text{M}$ . let him haue a pricke ouer his head, the fiste and sixt omitted the seauenth marke, the eight & ninth overpasse, the tenth note. Likewise the eleuenth and twelfth not regarded, point the thirteenth, & so for the two places neglected titling the nexte. Example.

2 1 0 9 7 4 6 2 5 3 2 4 1 3

Go to the last place noted or pricked, whiche is on the left hand, reckning all the Characters afoze that point leftward, with the figure vnder him, together, euē as their places from that title do appoynt, passing forth not staying to all the poynts, giuing to that, and to euerie of them thys tearme Thousand, returning again to the next figure significative ensuing the pricke. Now toward the right side still renuing youre course againe by the points, not forgetting this terme Thousand so oft to be named as you haue points to come vntill euerie figure is valued. Behold the counting of the summe immediately befoze wrytten. 21  $\text{M}$   $\text{M}$   $\text{M}$   $\text{M}$ . Bycause ther be four prickles, I giue this tearme thousand four times, represented by this letter  $\text{M}$ . Nowe returne agayne to the next figure of signification, following the pricke saying 97  $\text{M}$   $\text{M}$   $\text{M}$ . 462.  $\text{M}$   $\text{M}$ . 532  $\text{M}$ . 413. Thus doe of all such like. Here neede no moe words for so playne a matter.

There be three sorts of numbers, the one a Digit, the other an Article, the last a mixt or a compound. All numbers not exceeding 9 vnites, are called Digits, as 1 2 3 4 5 6 7 8 9. Articles be numbers of tennes, or those that may be deuided into 10 equal parts, as 10, 20, 30, 40, 340. &c. The compound is a number of both, as 12, 13, 14, 24. &c. Of Numeratio this here sufficeth.

### Of Addition. Chap. 2.

**T**O adde is to gather and knit in one many numbers of vnites, whereby the whole summe manifestly may appear, as 3, 15 and 22 maketh 40 the whole &c.



Beginne your collection from the right hand to the lefte, from the lowest number to the highest of that row, & what Digit resulteth, subscribe. Set your numbers in due place, yea directly the one vnder the other, with a line drawn beneath them, as in the Example. And note so many articles as surmounteth in any order ought to be adioyned to y next rowe or row leftward, calling the by the name of Unités, conueying the Digittes or Ciphre euer vnder the line. Now gather these summes in one which follow 9554.4030.9923. Place them rightely the firste vnder the first, and so correspondently, as by example here appeareth.

$$\begin{array}{r}
 9 \ 5 \ 5 \ 4 \\
 4 \ 0 \ 3 \ 0 \\
 9 \ 9 \ 2 \ 3 \\
 \hline
 2 \ 3 \ 5 \ 0 \ 7
 \end{array}$$

Now adde 3 and 4 whiche make 7, omitting the 0 signifying nothing: write 7 vnder the line in place due, then 2, 3, and 5 is 10, put the Ciphre 0 vnder, keeping the article in mind. Now 9, 0, 5, and one in memorie, yeldeth 15. Put the Digit 5 beneath the line, not forgetting the article at the next order, 9, 4, 9, maketh 22, and 1 in mind 23, put 3 downe, and the two articles reposed in memorie a place farther. Behold vnder the line your total summe, with your figures right placed. The whole Addition is 23507. Now money of diuers kinds is added, you shall perceiue when you come to the Addition of Numbers Cossicall.

## Of Subduction. Chap. 3.

**T**O subduce or subtray any sume, is wittly to pull a lesse fro a bigger nuber, or an equall fro a like or equall, so y remaine if it be any thing, do appeare. As if I take 35 fro 40, ther is left 5. In this kind you shal worke as afore from the righte side to the lefte, deducting the lower from the higher summe in that order subscribing the remnant. Also euery Element must haue his conuenient place, as is sayde of Addition, the one direct vnder the other. Note whesoeuer

the upper is the lesse number, or a Ciphre, then shall you consider the distance of the lower number from this article 10, and adioyne the same distance vnto the saide lesser number, subscribing it, giuing alwayes one vnite to the next Element.

### Example.

From 1304053 I would haue 400271 subdued, put them in right order, as ensueth.

$$\begin{array}{r}
 1304053 \\
 400271 \\
 \hline
 903782
 \end{array}$$

One from 3 remaineth 2 vnder the line with him in place meete, 7 from 5 it may not, the distance of 7 from 10 is 3, wherefoze I doe accompanie 3 with 5 and it maketh 8, put that 8 vnder, now 2 and 1 in memorie repoled, noteth 3, from the Ciphre 0 it may not be, the distance of hym from 10 is 7, whiche put to the Ciphre maketh but 7. Let hym haue his place in like manner vnder. This Ciphre 0 ensuing, and 1 in minde, encreaseth but 1. Take that from 4, remaineth 3, to be sette vnder the line. Againe, the Ciphre 0 from this circle 0 subtracted nothing is lefte. This 0 must haue place vnder. Then 4 from 3 it may not. The distance of 4 from 10 is 6, whiche ioyned with 3, maketh 9 to be placed beneath the line, now one in memorie taken from 1, remaineth 0, wherefoze this Ciphre 0 shoulde be put vnder, vnlesse it chance as it dothe heere in the last place. The summe remainyng of this Subtraction, is 903782, as appeareth vnder the line in the Example.

### Of Multiplication. Chap. 4

**T**O multiplie, is to find of two Numbers a nūber product the one in the other augmented, the which so often may conteyne the number multiplied, as there be of Vnites in the Multipliator. The lesse is named the Multipliator or

Multi



**M**ultiplier, the other summe; or number to be multiplied. In this kinde, you shall labour from the right side &c. The Elements there disposed in inst order, and wrought as the Examples following declare. I would multiplie 3020 by 3, dispose your numbers thus.

The number to  
bee multiplied. } 3020

The digite that  
dothe multiplie.      3

The Producte.      9060

**N**owe say 3 times 0 encreaseeth nothing, conuey thys 0 vnder the line, 3 times 2 causeth 6, subscribe 6, thrice 0 maketh nothing, write the Ciphre beneath the line. Thrice 3 produceth 9, put him vnder. Beholde your summe beneath the line 9060. Bycause the multiplication of Digittes is first necessarie to be knownen befoze any other Example be witten, I haue prepared for their augmentation a Table, not a little conducing to Partition, as to the practiser after shall appeare, the vse is this; you shall seeke the Digitte to be multiplied in the one side of the Table most commodious, the Multiplier in the other, at the common meeting of both, the Product sheweth himselfe.

Pythagoras Table.

1	2	3	4	5	6	7	8	9	10
2	4	6	8	10	12	14	16	18	20
3	6	9	12	15	18	21	24	27	30
4	8	12	16	20	24	28	32	36	40
5	10	15	20	25	30	35	40	45	50
6	12	18	24	30	36	42	48	54	60
7	14	21	28	35	42	49	56	63	70
8	16	24	32	40	48	56	64	72	80
9	18	27	36	45	54	63	72	81	90
10	20	30	40	50	60	70	80	90	100

**T**his Table of the Pythagorians was taught vnto chil-

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Dren.

ben, together with their first letters, being in dæde as necessarie to be conned by rote, and had in perfecte memorie for the perfection of Arithmetike, as the common letters, or spelling of Syllables are to the Grammarian. This Table therefore first printe lively in thy remembrance, and then boldly proceede farther, all difficultie I assure thee is past.

Another Example. I would multiplie 734 by 92.

<i>The number multiplied.</i>	734
<i>The Multiplier.</i>	92
	<hr/>
	1468
	6606
<i>The Producte.</i>	<hr/>
	67528

Four Figures on this wise placed, and a line vnder them drawe, with y first figure of your Multiplier which is 2, beginne thus, saying two times 4 encrease 8, put him vnder the line, even with 4, the first of your number to be multiplied. Then twice 3 make 6, conuey him vnder the line iust with 3, which is the seconde Character of your number to be multiplied. Two tymes 7 is 14, place the Digitte 4 vnder 7 the shirde of your multiplied number, and the article 1 a come farther, now dashe 2 with your penne, his office performed, being the first figure of your Multiplier. Then to the other Character, the second which is 9, saying, nine times 4 is 36, put the Digitte 6 vnder 9 youre seconde multiplier, the articles kept in mind, then nine times 3 is 27, and 3 reposed, yeldeth 30. put this 0 vnder 4, and 3 in memorie for the next place: nine times 7 is 63 and 3 in mind causeth 66, set 6 vnder 1, and the fire articles a place farther leftward, so by Addition you haue (as it is aboue vnder line written) this summe 67528, the whole Multiplication.

Compendious formes of Multiplication.

If you will multiplie by this article 10 100 1000 10000  
 &c. to y nuber which must be multiplied by these articles,  
 addes



adde so many Ciphers as goeth before the Unite.

Example 36 by 10, put the Cipher 0, and it is 360. Multiplie 45 by 100, adding the two Ciphers, is made 4500, and so of the rest. If by chance one Cipher or many come in the beginning of the number that multiplieth, or the number to be multiplied or both, put away all these Ciphers, reseruing them to the ende, multiplying the rest of the figures, and then adde al the Ciphers to the beginning or first place of the Product of that Multiplication. As 32000, by 2000, augmente 32 by 2, and put vnto the Product, whiche is 64, those six Ciphers, so is it 64000000. And whē Ciphers by chance come within the numbers, you may ouerleape those of the Multiplier. Also if you list to multiplie by 5, you may mediate or deuise your summe by 2 adding to the Product this Cipher 0, which must occupie y first place. Being adde, let 5 take the first roome, after the Mediation, not regarding the Unite left of the number to be diuided.

A rule whereby also the demonstration  
of Multiplication may be gathered.

**W**hen you haue numbers to be multiplied, diuide which summe you list into what parts you will, the y number not parted multiply in euery of those parts: the summes collected declare the same whiche the two whole numbers multiplied together woulde haue brought. Example.

I would multiplie 342041 by 1110, deuide this summe 1110 in parts as 1000, 100, 10, and with euerie of them multiplie the other 342041 the nūbers produced are these.

$$\begin{array}{r}
 342041000 \\
 34204100 \\
 3420410 \\
 \hline
 \text{maketh } 379665510
 \end{array}$$

*Now collected.*

This is demonstrated in the first Proposition  
of the second booke of *Euclides Elements*.

## Of Partition. Chap. 5.

**T**H deuide or parte, is ingeniously to find how oftentimes the diuisor is conteined in the number to be diuided, or to part any number into as many portions as your diuisor appoynteth. When diuision sheweth onely how often the lesse summe is conteyned in the bigger, as if I would diuide 40 by 8, that declareth how oftentimes 8 is conteyned in 40, so find I 5, and thus is my diuision perfourmed. The lesse summe is the Diuisor or Diuidēt, the other y number to be diuided or diuisible, vnder whome, the two lines or paralels must be drawen for your quotiēt, and the Diuisor vnder them. This kind being contrarie to Multiplication, requireth contrarie working, that is, from the lefte, to the right hand: your Diuisor there founde, how often he is conteyned in the number ouer him, that same Character placed in the quotiente, and the Diuidēt or Diuisor in that Character found multiplied, Subtraction made, &c. your Diuisor ought to be remoued to the next place toward the righte hand, and so to the ende, as by example moze playnely shall appeare. I would diuide 3089 by 3, at all times sette and order your number thus.

	0 2 2
<i>The number to be diuided.</i>	3 0 8 9
<i>The Quotient.</i>	1 0 2 9
<i>The Diuisor.</i>	3 3 3 3
	8

Paralels nowe drawen, and my Diuisor placed vnder the last of my number to be diuided, whiche was 3, I finde once 3 to be 3, which Subtracted from the Figure 3 right aboue him, nothing is left, dash 3. This one place betwēne the lines right ouer 3. The Diuisor 3 conuey to the nexte rowe rightward, where in the Ciphre ouer him, he is not once found, therefore put this Ciphre 0 betwēne the Paralels, right ouer y Diuisor, and so remouing a place farther, that



Under 8, there you finde the diuident twice: wherefore, put 2 in the quotient right vnder 8, then say twice 3 is sixe, which subtracted from 8, leaueth 2 ouer 8 dashed. The Diuisor 3 now dashed, is conueyed to the nexte and last place, whiche being founde 9 times in 29, put 9 in the quotient, saying, 9 times 3 maketh 27, that subducted from 29 aboue, 2 remayneth ouer 9, the rest dashed. Note if it chance that the Diuisor be conteyned oftner than 9 times, onely 9 put in the quotient. Behold another example 19031 to be diuided in 211 partes, place them directly thus.

$$\begin{array}{r}
 \text{The number diuisible.} \quad \begin{array}{cccc} & x & x & 4 \\ & 1 & 9 & 0 & 3 & 1 \end{array} \\
 \text{The Quotient.} \quad \begin{array}{r} 9 \quad 0 \\ \hline \end{array} \quad \begin{array}{l} 41 \text{ Remaynes.} \\ 211 \text{ Diuisor permanent} \end{array} \\
 \text{The Diuisor.} \quad \begin{array}{cccc} x & x & x & x \end{array} \\
 \begin{array}{cc} 9 & 9 \\ x & x \end{array}
 \end{array}$$

Paralels drawen, and all things placed as the example sheweth, bycause 2, the last of the Diuisor, is bigger than 1 the last of the number to be deuided, he hath place vnder the next, which is 9. 2 is conteyned in 19 nine times, therefore put 9 in y<sup>e</sup> quotient, placed as you see vnder 9, saying 9 times 2 is 18, take that out of 19, there remayneth 1 to be set ouer 9, dashing 2 and 19 with your penne. Then 9 times one is 9, strike one, take that out of 10, ouer remayneth 1 ouer the Ciphre, the vnite leftward put out. Now to the last of your Diuisor, 9 times 1 is 9, dash 1, take that 9 out of 13, aboue remayneth 4 ouer 3, strike 13 with your penne. remoue your Diuidente a place farther rightwarde, the rest following leftward in order. See how oftentimes your Diuisor may be had out of the number ouer him, that is no time, put therefore the 0 in your quotient, dashing euery Element of your Diuident, permitting the remaynes to be set ouer the Diuisor, and so you haue in your quotient 90, there remaynes 41. In like manner, all other numbers are diuided.

Use in this matter preuayleth, and openeth that whiche many wordes can not.

Diuision beeing but a conuerse working, or resolution of Multiplication, is demonstrated by the foreledged firste Proposition of the second Booke of the Geometrical Elements.

### Speedie and compendious fashions of *Diuision*.

**L**ike howe manye Ciphres the Diuisor hath afore the figures of signification, so manye places separate by line, or cutte away at the beginning of your number that shall be diuided, the rest shall suffer partition by the Characters only signifiatiue, as is declared with mixt Ciphres in your Diuident.

Example.

The number to be diuided, is 3454000: the Diuisor 30200: Let two Ciphres vnmixt in your Diuisor, therfore two places in your nūber to be diuided must be cut away, then the rest stand thus to be diuided.

$$\begin{array}{r}
 \begin{array}{r}
 11 \\
 \cdot 33x \\
 043x2 \\
 \hline
 \text{Diuident.} \quad 3454000 \\
 \text{Quotient.} \quad \underline{114} \\
 \text{Diuisor.} \quad 30200
 \end{array}
 \left| \begin{array}{r}
 11200 \text{ Remaynes.} \\
 30200 \text{ Diu. permanēt.}
 \end{array} \right.
 \end{array}$$

The remaynes 112 shall be ioyned with the Clemēt cut away and put ouer the whole Diuisor as aboue. This as I thinke is sufficient for Diuision, more woulde rather discourage than farther.

### Of Reduction. Chap. 6.

**R**educe, is to bring a number of grosse denominatiō into a smaller or contrarie. Grosse to subtil by multiplication,



tiplification, Subtile, to grosse by partition is perfourmed. A number of grosse Denomination is that, which conteyneth manye other subtiler or smaller, as a Pounde in respecte of Shillings. Shillings in comparison to Poundes are a subtile denomination. If you will reduce any grosse summe into a subtiler or contrarie, you must well ponder how many of that smaller do make one of the grosser, and by that multiplie or diuide, as occasion is giuen. I woulde bzing 600 lb into halfe pens. Firste you must reduce them into Shillings, multiplying by 20. Then augment the Product by 12, so be produced pens, and for halfe pens multiplie the summing number by 2. The whole summe reduced, standeth thus 288000 halfe pens. Powe by partition this subtile summe is brought to his former estate, that is, 600 lb. In like maner, a Mile in respect of Furlongs, Furlongs compared to scores, Scores to pearches, Pearches to yards, Yards to fete, Fete to ynches, Ynches to Barlie cornes referred, be of grosse Denomination. But Barlie cornes to ynches, Ynches in respecte to fete, and so bpwarde, haue a subtile Denomination.

Our English mile grounded vpon the Statute, hath ordeyned thre barlie cornes drie and round to make an ynch, twelue ynches a fote, thre fote a yard, fiue yards a pearch, & fortie pearches in length, & four of breadth, an acre of land: so the acre conteyneth 160 pearches, the halfe 80, and the yarde, whiche is the quarter 40. Twentis yards make a Score, and fortie pearches a Furlong, 8 furlong a Mile. So that by Reduction, you may find in the English mile 320 pearches, 1760 yards, 5280 fote, & 63360 ynches, somewhat greater than the Italian mile of 1000 pace, & 5 fote to a pace.

Of waight according to the Statute of England.

The English Pennie which is called the Sterling round without clipping, shal wey 22 graines of wheat dry, & in the midst of the eare, 20 pens maketh 1 ounce, 12 ounces maketh 1 pound,

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a pound,

*Handwritten notes:*  
 A myle  
 to pearches  
 16 a furlong  
 8 furlongs  
 a myle  
 320 p  
 1760 yards  
 5280 fote  
 63360 ynches  
 1000 pace  
 5 fote to a pace

a pounce, and this weight is called *Troy weight*, which the Goldsmithes commonly use. By this which is said, you may gather the ounce to containe 440 graynes of wheate, and the pound 5280. There is another more usuall weight called *Haberdepoyse*, the Scruple conteyneth 20 Graynes of Barlie, as the Denarie of *Troy*, the Dramme 3 scruples, the ounce 8 Drammes, so ye maye perceyue 480 Graynes of Barlie in the ounce, and 7680 in a pound: but these rates often alter.

### Of Progression, or rather of most compendious Addition. Chap. 7.

**P**rogression is a very compendious way to knitte and gather in one those numbers which do procede with an even and equal distance. In all Arithmetical Progression, you shall conioyne the extreames, augmenting the number of those extreames so added, with the number that sheweth how many places there be in the whole rownd of your progression, the product mediating, as 5. 10. 20. 25. 30. 35. By adding the extreames which is 5, and 35 encreaseth 40, multiplie it by the places which is 7, riseth 280, divided by 2, or mediated, sheweth 140 the whole summe. There is another kinde of Progression, named Geometricall, whiche encreaseth by 2, 3, 4, 5, or mofold infinitely, behold  $\frac{1}{2}$  figure.

1	2	4	8	2
2	6	18	54	3
3	15	75	375	4

I call it *fuefold*, when the first number may be founde full 5 times in the next summe, and so of the rest. For these and all other like, multiplie the last number by that it folded, subtracting the first from the product, continually dividing by one lesse, than the doubling or folding is. Example 1. 2, 4, 8, 16, 32, 64, this number foldeth by 2, therefore multiplie the last 64 by 2, which maketh 128. Subtracte 1,

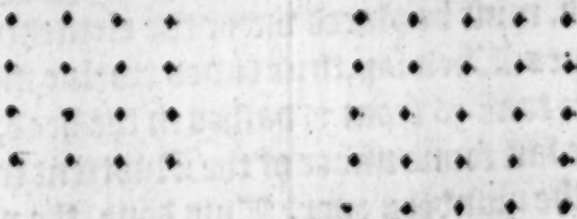
the



the firste figure, so remayneth 127, that diuided by one lesse than the folding agayne 127 riseth, the whole summe of your Progression. Note if you multiplie the last, or any other place of Geometricall Progression (beginning wyth an Unite) with himselfe, the product sheweth as many more places saue one. Example. I woulde haue the fourteenth place, or some of the Progression immediately aboue written, 64 the last number of that proportion, declareth 7 times or places, and in hymselfe multiplied, bringeth 4096 the thirteenth place, now multiplie by 2, with which it folded, so haue you 8192, the fourteenth some your desire, for the true value of all, do as is aforesaid of Geometricall Progression.

### The finding of Rootes of Square numbers. Chap. 8.

**T**o find the square *Radix*, or Roote of any number, is to gather a summe that multiplied in himselfe, if it be quadrate, iustly may make the aforesayde number, or else it may engender the bigger squares summe in that conteyned. A square number is that which resulteth of any number once multiplied in himselfe. A quadrate *Radix* is called that number, whiche by himselfe multiplied, yeldeth a square summe. To quadrate or to augment squarely, is to encrease any number with himselfe, as four times 4, maketh 16, it followeth 16 to be a square number, and 4 of that summe the roote or *Radix*, even so of al other. A square number deuised by vnites, maketh a quadrate Figure as appeareth:



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Bycause

Bycause the Quadrate roote differeth little from Division (for it is as it were a kinde of Partition) it needeth not many wordes, you shall beginne to worke as in that kinde, that is, from the left hand to the right, putting downe your numbers, separating euerie two elements from the beginning with pendente or hanging lines, drawing also two Paralels vnder them for your quotiente.

Example.

I would haue the *Radix* of 3969, place and handle youre numbers thus.

	c	
	03	00
The number proposed.	39	69
The Roote Q.	6	3
The double numbers	36	29
of the Rootes.	16	
	3	

You shall search for a number, which multiplied in himselfe, may consume as nigh as may be 39, being the two first figures leftwards separated by line, which is 6, put him betwene the Paralels vnder 9. Then saye sixe times 6 is 36, take it out of 39, so remayneth 3, to be written ouer 9. This done, double your Quotient 6, which maketh 12. That doubled number ought to be set vnder the Paralels, the firste 2 vnder 6, the next 1 vnder 9. Again, you ought to find a number, which multiplied in y<sup>e</sup> said double, shal wast the summe leftwarde, and directly aboue it in the head: you may find y<sup>e</sup> number to be 3, which you must put in the Quotient vnder 9, the next place following the double. Note your Radicall Digites found, must be placed vnder the elemente nexte to the pendent lines. Then say, three times twelue maketh 36. After you haue take 36 from 36 dashed in the head, you shall multiplie 3 the last found nūber of the Quotient in it selfe, & take it out of the numbers ouer. This done, the number is perceyued to be square, because nothing remayneth. The

Qua

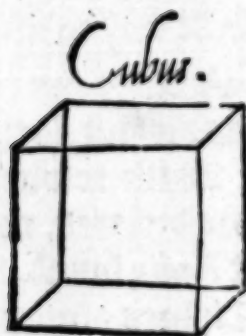




the integers of your roote, as a Fraction, whose name (of the article) he must haue by whome he was multiplied, and thus procéde, till you haue all Ciphers, yea so many, as halfe the afoze added. The more Ciphers you put at the beginning, the more preciser your roote shall be. Here needeth no example, if all things aboue witten be vnderstode.

### The finding of the Cubicall roote or *Radix*.

To search or pull out the *Radix*, or roote cubical, is to get a summe multiplied once by himselfe, and again in the Product engendring the number proponed if it be Cubicall. A number Cubicall is that whiche by multiplication in hymselfe, and agayne in that surmounteth, is ingendred. *Radix* or Roote Cubicall, is that number so multiplied, making the said summe cubicall. To multiplie anye number cubically, is to encrease it once in hymselfe, and againe that number with the product, as if I woulde multiplie 4, 4 in hymselfe maketh 16, and foure times 16, is 64. A solidate cubicall figure, is imagined with sixe square *Superficies* or sides like a Dye, as this Figure sheweth.



The searching of the roote Cubicall, is not very vnlike to the finding of the quadrate roote, this first excepted, that the Figures must be put downe, euery thirde separated from



from the beginning with hanging lines: beholde the Example.

	0	(2)	7	6	
	2	2	2	8	(4)
The number proposed.	4	9	4	8	6
Radix Cubicall.	3	3	3	3	3
The tripled Rootes.	2	7	4	9	6

All things well disposed as is saide, now I must seeke a number multiplyed in himselfe cubically, whiche may take away as nigh as maye be 49: 4 is too much, 3 will serue. Put downe 3 in your Quotient vnder 9 next to the pendent line rightwarde, multiplying him cubically, the Product 27 subducting from 49, remayneth 22 ouer their heads. Then triple 3, setting the Producte vnder the nexte elemente saue one, from the Digit last found rightwarde, whiche is there vnder 2, and the other following in order leftwarde if there be mo. Note oftentimes as it is said in the square, the number aboue the threefold leftward is so bigge, that with ease the Radical Digit can not be found. Therefore suppose this 0 to be betwene your Paralels in stead of your Digitte, a rowe beyonde all the threefold rightwarde. The resulting then of your Quotiente increase by the threefolde number, and with the summe that surmounteth, diuise the Characters aboue the threefold and so leftwarde, the Quotiente of that partition appeareth to be the Digit, so that the remain of that diuision, ioyned with the element, vnder whome the Digit must be put, be more or equall compared with the cubicall multiplication of the last founde digit. Otherwise 1 or 2 lesse at the most will serue. The next digit on this wise founde, being here 6, let him be augmented together with the first in the threefold number 9, thus 36 in 9, maketh 324, and the same againe with the last found digit multiplyed,

so haue you 1944 to be subtracted from aboue the threesolde 9, and so leftward, whiche number is 2242, then remayneth 298, the figure 8 to be set ouer the head of 2. This 6 the last Digit sounde, and so all other, must be placed immediately (when it is searched out) euer a place farther betwene the Parallels rightward than any figure of your double, that is at all times vnder the Element nexte to the Pendente line. Now multiplie 6 Cubically, which is 216 to be Subtracted from the Characters aboue him and leftward, so remaineth 2764, wherefore the number wroughte, is not Cubicall, Note when your Write is too much to be put in your Quotiente, then let this Ciphre 0 take place, and so procede to the ende, tripling as afoze all youre Radicall Digittes. This whyche is sayde, sufficeth for all manner numbers, much vse rather than many wordes is here required.

Another precise vway for the finding  
of this Cubicall Roote.

**A**Dde towarde the righte hande as is sayde in numbers square to any sunne so manye Ciphres as you list, so that those added Ciphres may be diuided in three partes equally, as 000, 02 000, 000, 03 else 000, 000, 000, that is 3 at the least 6 or 9. Of the number that surmounteth, take the Cubicall Note, as aboue is sayde, the Remaynes nothing regarding. Pull away toward the righte hande so many Elements as the third part of the afoze added Ciphres amounte to, the other leftwarde keepe as the Integers of your Radix. Powe with these Elementes pulled away, worke as is sayde in numbers square in the seconde finding, euer cutting away toward the right hand so many elements as the third part of the afoze added. Better it is, if you worke still by one Article.

How



## Howv the Denominator is founde to the Remayes Cubicall.

**Y** Du shall firſte ſquare your Cubicall *Radix*, that ſquare triple, Triple alſo  $\frac{1}{2}$  *Radix*. Adde theſe triples together, adioyning 1 to the reſulting ſumme, maketh the Denominator.

**D**2 multiplie the *Radix* in the triple of an number, one Unite bigger than the ſaid *Radix*, and to the product of that Multiplication, adioyne an Unite, ſo haue you the deſired Denominator.

**D**3 adde an Unite to your *Radix*, and encrease the reſulting ſumme by your Roote Cubicall, this product triple, and adde thereto an unite, ſo ariſeth the Denominator alſo.

This Denominator ſhal be placed vnder a ſtreight line, drawen at the right hand of your Quotiente, as in the laſt Example you maye behold. Then ſet ouer the ſame the remayne of your Roote, ſo haue you a Fraction, whole nature you ſhall immediately know.

## The prooues of all the kindes afore mentioned. Chap. 10.

The contrarie kind is  $\frac{1}{2}$  true examinatio of  $\frac{1}{2}$  other, as by

{ Addition } Subductio } Multipli. } Augmentation }  
{ Subtractio } Collectio } Diuiſion } Partition. } is proued.

Although this ſuffice for breuitie, yet I ſhall at large put forth the prooues.

After you haue added your numbers together, pull out any ſumme or row there conteyned, the other ſummes not ſubtracted, ſhall remayne, if you haue well done.

Adde the numbers which you did ſubtraher vnto the Product, and it ſhall be equall to the firſt ſumme.

*D. 4.*

*Diuide*

Diuide the *Producte* eyther by the *Multiplicatoz*, or the number to be multiplied, and the other part sheweth hymselfe.

Multiplye the *Quotient* with the *Diuisoꝝ*. If the number that surmounteth with the rest remayning, make your number that was diuided, you haue rightly done.

When grosse into subtile is broughte, *Diuisio* by the *Multiplicator* bringeth the greate former summe. Subtile in grosse wrought in like manner, *Multiplicatio* proueth it.

Out of the whole summe gathered, subtract euery number in the row, the last subducted, nothing shall remayne.

The *Roote* or *Radix* in himselfe must be multiplied, and if there be any thing left, let it be added to the *Producte*, so haue you the first summe.

Euen so the *Cubicall Radix*, augmented in himselfe cubically, adding the remaynes, yeldeth the former summe.

The false pꝛoofes by nines, *Multiplication* in squares, *Diuisions* peculiar to one forged diuident, accompting by *Counters*, and such like, are heere omitted, bycause they doe rather trouble, yea lade wittes than pꝛofite.

Thus endeth the firste part, teaching the supputation of *Integers*, and heere followeth the second of *Fractions*.

### The expressing of the vulgare or common *Fractions*. Chap. 12.

**A** Fraction is a Distribution, appointed of a part or partes of an Integer. As the *Integers* take their beginning at 1, and continue in number without ende, euen so the said *Integers*, by imagination from one second part, maye be dissolved, or broken in portions or partes infinite. The partes of those simple or principall fractions, haue also to them partes following. To attayne the knowledge of them, acquainte your selfe with these two termes, *Numerator*, and *Denominator*. The office and duetie of the firste, is, to  
expresse



expresse the number of such parts. The Denominator doth  
giue to those parts their names, as  $\frac{1}{4}$  which is three parts  
of a thing divided in 4. The Numerator is called the Ele-  
mentes or Figures that be alway set aboue the short line.  
The Characters or Elements vnder, beare the name of the  
Denominator. The Numerator is at all times firste pro-  
nounced, as  $\frac{2}{3}$   $\frac{3}{4}$   $\frac{1}{5}$  as two thirde, three fourthes, one fift.  
Simple or principall Fractions be euer as afore written,  
but fragmentes of Fractions thus,  $\frac{2}{4}$   $\frac{1}{5}$  and numbred on  
this wise, two fourths of one fift, of one sixt: note these Fra-  
ctions following  $1\frac{1}{2}$   $2\frac{1}{3}$ . The last being leftwarde, maketh  
one whole, the Numerator being as much as the Denomi-  
nator, the other following, giueth one Integer, and one  
ninth, the Numerator exceeding the Denominator by the  
ninth part. The third wāteth one Unite to create a whole,  
the Numerator being destitute of one third. The bigger the  
Denominator, the further the Fractions are from the  
whole. In Supputation, there doth assemble and runne to-  
gither numbers both greate and small, whole and broken,  
principall Fractions, with Integers and Fragmentes of  
Fractions. Therefore of necessitie to auoyde confusion, I  
must firste declare how to reduce these diuers kindes into  
one fashion or likenesse.

## Of Reduction in Fractions.

### Chapter. 12.

**T**O reduce, is to bring Integers into Fractions or con-  
trarie, yea a fragment or Fractions of diuers Deno-  
minations into one, or what name you list. You shall re-  
duce Integers or whole, into what parte you will, multipli-  
ing the Integers by the denomination of those partes, as if  
I would breake 8 whole in thirde, multiply 8 by 3, riseth 24.  
If I would bring 5 Integers and  $\frac{1}{2}$  into one name, I must  
multi-

multiplie the Integers into the Denominator 4, adding to the Product 3, so haue yee  $\frac{7}{4}$ . To reduce partes of fractions into whole, diuide the Numerator of those fractions by the Denominator, as  $\frac{7}{4}$  diuided by 4 proceedeth 6 Integers  $\frac{1}{4}$  of an whole. The remaines ever acknowledge their names of the Diuisor, and beare the proportion to the whole (or Integer) of the Numerator to the Denominator, whiche was Diuisor. When ye will change great partes into the lesse or contrary, yee shal multiply the Numerator of it that you intended to chaunge, into the Denominator of it, into whom yee will make the change, and whatsoeuer resulteth you shal diuide by the Denominator of it that yee began to chaunge, so haue yee those partes which yee required, risen out of the Diuision.

### Example.

I would reduce  $\frac{7}{8}$  into seauenthes, augment 5 into 7 encrease 35, diuided by 8 sheweth in Partition 4, and 3 the remayn which signifieth  $\frac{3}{8}$ , so of  $\frac{7}{8}$  brought into seauenthes commeth  $\frac{4}{7}$  and  $\frac{3}{8}$  of one seauenth parte. Whensoeuer in suche Reduction there is leste anye remayne after the Diuision made, it is a fragment of a fraction and shal take his name in the Nominatiue case of the Denominator of that whiche is the Diuisor, and receyue bys other name in the oblique case of the Denominator into whom the change or reduction is made. Fragments of fractions be thus brought into principall fractions. Multiply the Numerators in themselves forgiue one common Numerator. Also the Denominators by themselves, causing one Denominator in common, as  $\frac{2}{3}$ ;  $\frac{1}{4}$ ;  $\frac{1}{5}$  so reduced bringeth  $\frac{4}{60}$  of one Integer. To reduce two fractions to one principall fragmente multiplie the one Denominator by the other, so haue yee produced a common Denominator. Then multiplie the Numerator of the one fraction into the Denominator of the other, and againe the Denominator of the other fragment into the Numerator of the first.



firste, adding the **Produtes** together whiche shall be a **Numeratoz** in common. As thus  $\frac{2}{7}$  and  $\frac{1}{4}$ . Multiply as aboue is sayde 3 in 4 that is 12 the common **Denominator**, then 2 the first **Numeratoz** augmented in 4 maketh 8. But that 8 aboue  $\frac{2}{7}$ , then multiply 5 the **Numeratoz** of the second **Fraction** in 3 increaseth 15, the whiche note ouer  $\frac{1}{4}$ . These peculiar **Numerators** added together, riseth 23. All right over the 12 after this fashon  $\frac{23}{12}$  so  $\frac{2}{7}$  and  $\frac{1}{4}$  make  $\frac{23}{12}$  of the which 8 be made of  $\frac{2}{7}$  and 15 of  $\frac{1}{4}$ . Beholde.

### The Example.

$$\left\{ \begin{array}{cc} 8 & 15 \\ \frac{2}{7} & \frac{1}{4} \end{array} \right\} \frac{23}{12}$$

Manye and diuerse **Fractions** on this wise be broughte to one simple **Fraction**. After yee haue produced two of the firste **Fragmentes** as aboue, then multiplie the common **Denominator** (first reduced) into the **Denominator** of the nexte **Fraction** to be reduced. Of that riseth a **Denominator** in common. Nowe for youre **Numeratoz** worke thus.

Yee shall multiply the **Numeratoz** of the first reduced into the **Denominator** of the thirde, whiche is to be reduced, and contrarie the **Denominator** of the **Reduct** into the **Numeratoz** of the last **Fragment** to be reduced, so by **Addition** yee shall haue a **Numeratoz** in common, even thus of all **Fractions** howe manye soeuer they are. The first alwayes dispatched, adioyne the nexte, vntill yee haue perused them thorowly.

### Example.

$\frac{2}{7} \frac{1}{4} \frac{1}{2}$ . After yee haue reduced the 2 firste thus  $\frac{23}{12}$  adioyne to him the next on this wise,  $\frac{23}{12} \frac{1}{2}$ . Nowe multiplie the **Denominators**, commeth 24 the common **Denominator**.

Then

When 23 by 2 encreaseeth 46, and 12 by one multiplyed yeth  
 deth 12, 46 and 12 added make 58 the Numerator in common.  
 Thus standeth your fractions above written, reduced  $\frac{58}{12}$   
 which contain 2 integers, and  $\frac{1}{3}$  of one integer. Parho  
 wel if integers, fractions, and fragments of fractions shall  
 fortune to come together, bring them all to principall frag-  
 ments as above is declared, that done, perfozme every thing  
 by the rules aforesayde.

### The Abbreviation of Fractions.

Chap. 13.

To abbreviate any fragment, is to bring a fraction to  
 his lest denomination. To make this abbreviation, yee  
 must divide the Numerator of the fraction, and so in the  
 like maner the Denominator by the biggest number, that is  
 some common part of them both. The Quotient by division  
 of the Numerator, sheweth the Numerator of the fraction  
 abbreviated. Likewise by partition of the Denominator  
 his fragment in the Quotient appeareth.

#### Example.

I woulde abbreviate  $\frac{12}{4}$  divide 4, the Numerator by 4,  
 which 4 so appeareth 1. Now 12 divided by that 4 ariseth 3,  
 for the Denominator, which also have place thus  $\frac{3}{1}$ , being  
 the least Denomination. This big number is founde by di-  
 viding the Numerator, with the Numerator of the fraction.  
 If nothing be left of that partition, the Numerator or  
 Divisor is that great number as afoze. When any thing re-  
 mayneth, with that divide the number that afoze yee made  
 your Divisor, and thus continue on til nothing remaine, so  
 your last Divident is that gret number which sequeth your  
 tourne. In case by often Partition your last Divisor cometh  
 to an Unite, the those fractions or numbers be called *Contra*  
*se Primi*, and may not be reduced to any lower name.

How

How to knowv the value of remnants that be left by Diuision of Integers or whole.

**T**O make short worke, reduce the Integer into the moste subtle Denomination that to him belongeth, then multiply that reduction by the Numerator of the Fraction, and diuide by the Denominator of the sayde Fragment, the quotient uttereth the value of the parts of Fractions. Here needeth no example.

### Of Addition. Chap. 14.

**T**O ad in common Fractions, is to gather and reduce many Fragmentes to one summe or principal Fraction. This is sufficiently entreated of before. Notwithstanding I shal not spare here somewhat to say. If your Fraction be of one Denomination, then gather or adde the Numerators together, subscribing the Denominator, as  $\frac{2}{4} \frac{1}{4} \frac{1}{4} \frac{1}{4}$  maketh  $\frac{5}{4}$  which is 2 hole, and  $\frac{1}{4}$ , but being diuerse and unlike, multiply the Numerators by the Denominators crosse wayes, adding them together, so haue ye a common Numerator, to whom subscribe a Denominator common.

Example.

$\frac{2}{4}$  and  $\frac{1}{4}$  produce  $\frac{3}{4}$  to the whiche ye may adde  $\frac{1}{4}$  that maketh a  $\frac{4}{4}$ , being 3 hole, and  $\frac{1}{4}$ . Note if Integers and Fractions shall accompany together, first adde the Integers, after the Fractions, & if the Fragments may create an Integer, adioyne them to the other whole.

### Of Subduction. Chap. 15.

**S**ubduction is the taking of the one Fraction from the other, the lesse from the greater, or equal from the like



or equall. Those fractions be named the greater, whose Numerator multiplied in the Denominator of y other, engendzeth the greater number. Subtracte  $\frac{1}{2}$  from  $\frac{3}{4}$  remaineth  $\frac{1}{4}$ , whiche is one whole. When the Denominators be diuerse as  $\frac{1}{2}$  from  $\frac{1}{3}$ . Multiply 5 with 2 cometh 10 the common Denominator to be set vnder. Then foure times 2 yeldeth 8. In like manner thre times 5 bringeth 15. Nowe Subtract 8 from 15, remaineth 7, the which hath place thus,  $\frac{7}{10}$ . When yee woulde Subtracte  $\frac{1}{4}$  from 4 Integers and  $\frac{1}{2}$ , the last fraction being lesse then  $\frac{1}{4}$ , enforceth you to Subtracte one out of 4, resolving him into seconds, and adioyned to the other so haue ye  $\frac{1}{2}$ , from whome take  $\frac{1}{4}$  remaineth  $\frac{1}{4}$ , abbreviated  $\frac{1}{8}$ , to whome adioyne 3 whole, it standeth thus,  $3\frac{1}{8}$ . If yee list to take 6 and  $\frac{2}{3}$  out of 8 and  $\frac{1}{3}$  the Integres being reduced into their proper fragments, make your Subduction as aboue is sayd, so remaineth 2 and  $\frac{1}{12}$  of an whole.

### Of Multiplication. Chap. 16.

**M**ultiply the Numerators together in themselves, then the Denominators, so haue yee both a Numerator and a Denominator in common.

#### Example.

$\frac{2}{3}$  and  $\frac{1}{2}$  by  $\frac{3}{4}$ . Two times 3 maketh 6, once 6 yeldeth 6 whiche multiplied in 4 bringeth 24, the common Numerator. Then thre times 4 increaseth 12, that augmented in 2 engendzeth 24 and so in 5 surmounteth 120, the Denominator in common, which all standeth thus,  $\frac{24}{120}$ , but abbreviated in this wise,  $\frac{1}{5}$ . Three Integers by  $\frac{2}{3}$  or contrarie be thus multiplied, 2 the Numerator of the fraction multiplied in 3 bringeth 6, which 6 must be written ouer the Denominator of the fragment thus  $\frac{6}{3}$  or 2 Integers. Integers by multiplication growe both in quantitie and number, the fraction

tion increaseth onely in number and diminisheth in quantity. Note when whole be ioyned with simple fractions, onely or with Integers coupled with fragments, or else contrarie, Reduce the Integers and iojne them to their proper fraction, and after multiplie them according to the Arte of Fragments.

### Of Partition. Chap. 17.

If your Fractions be of one Denomination, diuide as in Integers, putting the remaines ouer the diuisor. I would diuide by  $\frac{6}{8}$  the quotient bringeth forth 1 whole, and  $\frac{2}{8}$ . Let your Diuisor be euer placed on the left side. When the Denominators be vnlike, ye shall multiplie crosse-wise as by  $\frac{2}{3}$  diuide  $\frac{4}{5}$ . Augment 3 in 4 there commeth 12 the Numerator, the 8 by 2 riseth 16 the Denominator, they haue place thus  $\frac{12}{16}$  and abbreviated on this wise  $\frac{3}{4}$ . When Integers commeth to be diuided by simple or principall fractions or contrarie, the Integers ought to be set aboue the line after the manner of fragments putting vnder the Unite, the Diuident (as I haue sayde) occupying the left side. Nowe worke as aboue ye haue learned in diuision of fractions.

#### Example.

By  $\frac{5}{7}$  denide  $\frac{1}{2}$  riseth  $\frac{5}{14}$  abbreviated thus  $\frac{5}{14}$ . Another example by  $\frac{2}{3}$ , parte  $\frac{1}{2}$  so commeth  $\frac{15}{6}$  whiche is 7 Integers and  $\frac{1}{2}$ .

If Integers with principall Fractions yea or fragments of Fractions come to be diuided by Integers or whole whiche be accompanied with simple, broken, or fractions of fragments, when these broken are reduced to a simple fragment, and the Integers to the same kinde that his ioyned fraction is of. Then performe your Partition as aforesaid is sayde.

## Of the Quadrate roote, Chap. 18.

If ye may, take the Quadrate roote both of the Numerator and Denominator, as in the Integers: for example thus, of  $\frac{4}{9}$  the Quadrate roote is  $\frac{2}{3}$ . Now followeth a general waye for all manner of fractions.

Suppose a number and multiply it with the Denominator of your fraction, the product shall be the Denominator of the *Radix*. Then for your Numerator, multiply the number alsoe supposed in himselfe, and that which redoundeth augment in the Denominator of the fraction, the product multiply in the Numerator of the fraction, then of that mounting summe, take the Roote as is said in the eighth Chapter of this first booke, which is the *Radix* of the Numerator. Now place them one over the other abbreviating if neede be. The example of the Cubicall roote following, maketh this which I haue sayd, manifest.

## Of the Cubicall roote. Chap. 19.

For the Cubicall roote worke thus. Example  $\frac{1}{27}$  let your number supposed be 6, with it multiply 27 riseth 174 the Denominator. Now increase 6 in himselfe Cubically cometh 216, which augmented with 27 bringeth 6364, the product, again multiplied by 27 engendereth this summe 181656 which to conclude, multiplied in the Numerator of your fraction, surmounteth this 1816560. Nowe the *Radix* cubicall founde (as is mentioned in the ninth Chapter of this booke) sheweth your Numerator which is 122. Put your Denominator vnder him thus,  $\frac{122}{174}$  abbreviated maketh  $\frac{2}{3}$  and  $\frac{2}{27}$  of an whole. Thus get the Cubicall roote of al other fractions.

Of



Of the Rule of Proportion, commonly called the Golden Rule.

Chapter. 20.

**T**his Rule is also called the Rule of three, for as muche as by three proportionall numbers knowen, it alwaye searcheth out the fourth proportionall, as if nine yardes of Veluet cost eleuen poundes, what shall 33 of the same cost. Where are three numbers giuen, and a fourth demaunded. For the resolution of this and all suche like, worke by the Rule ensuing.

The Rule.

Multiplie the last number by the seconde, and diuide the Product by the first number, so will your Quotient and remayne discover the fourth proportionall desired.

*The Demonstration of this Rule is grounded on the 19 Proposition of the seauenth Booke of the Geometricall Elements.*

Example.

I multiplie 33 by 11, there ariseth 363, whiche diuided by 9, yeeldeth in the Quotient 40, and in the remayne  $\frac{3}{9}$ , whych reduced, maketh  $\frac{1}{3}$ , I conclude therfore 33 yardes of the same Veluet shall cost fortie Poundes, and a Noble.

*If 9 yardes of } 11 Poundes, { 33 yardes } 40  $\frac{1}{3}$  Poundes.  
Veluet coste } myll coste }*

But in placing of the three numbers this must be obserued, that the first and third be of one Denomination, as in this question they are both Veluet, and that the numbers proponed for a paterne, be firste placed, and the number, whose fellowe you seeke, be alwayes placed last. Where I tearme first and last, according to our vsuall manner of writing from the left hande to the right, and not as in Numeration.

E.iiij.

The:

## The Rule of Proportion

Inuerfed.

**T**He Rule is termed Inuerfed, when the question is so proponed, that according to the course of the numbers, the fourth shoulde surmount the thirde, and yet in reason it must in deede be lesse, or contrariwise by course of numbers diminishing, when it ought to encrease: As if twelue Masons be able to make a certayne wall in twentie dayes, how many shall make the same in five dayes.

*{ The numbers } If 20 Dayes giue 12 Men, what yeldeth 5 Dayes?*  
*{ in order placed }*

Where it is apparante, that by the course of these numbers, as 12 is lesse than 20, so the fourth soughte shoulde be lesse than five, and therefore consequently muche lesse than 12 dayes, but reason teacheth me, that if twelue men be 20 dayes about a peece of worke, to dispatche the same in lesse time, it beboueth me to haue more than twelue men. The course of numbers therefore, and the trouth in reason being repugnant, I must worke by the Rule of proportio inuerfed. That is, to multiplie the firste by the second, and diuide by the third.

Example.

20 multiplied by 12, produceth 240, which diuided by five, yeldeth 48. So many men I say are to be employed to finish the wall in five dayes, and therefore the Question resolved, standeth thus:

*{ If 20 Dayes bee } the worke by 12 Men, then to finish it in five*  
*{ required to finish } Dayes, you must provide 48 Men.*

The

## The Golden Rule double wrought.

**S**ometime questions are proponed, wherein the Rule of Proportion must be twice wrought, before the question can be resolved. As if five Cannons at a batterie spende 60 Barrels of Powder in two dayes, how much Powder will suffice for foureteene Cannons for five dayes. Their numbers you must dispose in order as followeth, so as the firste and last be alwayes in every operation of one Denomination.

{ If five Canons spend 60 Barrels, what shall 14 Canons.  
 { If two Dayes require 168 Barrels, what shall 5 Dayes.

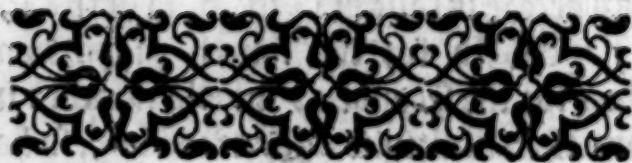
Thus you see the first and last in eyther row of numbers, to answer in Denomination. In the first Cannons. In the other Dayes: And of your five numbers proponed, three placed in the first row, and two in the second, leaving a space in the middlest for the fourth proportional to be found thus. I multiplie as before is taught 14 in 60, ariseth 840, whych divided by 5, yeldeth for the fourth proportionall 168, whiche I place for the seconde or middle number in the second row, and then multiplie agayne 168 by 5, so haue 840, which divided by two, yeldeth in the Quotient 420, so manie Barrels of Powder will suffice foureteene Canons for five dayes Batterie.

I forbear in this place farther to entreate of the appli-  
 cance of this Rule, whose vse shall in many Militare ques-  
 tions heereafter be declared. And for that my chiefe in-  
 tention in this Treatise is to shew how *Arithmetike* maye  
 stande a Souldioure in stead, I forbear to intreate of the  
 Rules of Alligation, and false positions, as thyngs fri-  
 uolous for that purpose, and meane onely to open so  
 muche of the Arte of *Algebra*, and firste *Equations*, as  
 shall to that ende bee requisite, reseruing the more  
 exquisite



exquisite handling of the curious *Cubicall Equations*, and  
secret Demonstrations of that Arte, to a peculiar trea-  
tise, wherein I will prosecute the methode of *Cardanus* in  
his tenth Booke, and supplie (God sparing life) the im-  
perfections thereof.

Here ensueth the seconde Booke, teaching all these Arith-  
meticall kinds in numbers Denominate, commonly called  
Cosicall, with certayne new Characters, inuented and pra-  
ctised by my Father, for the more speedie dispatch in the  
working of supputations Algebraicall. It contey-  
neth also certayne Equations necessarie to be  
known, for the resolution of such mili-  
tarie questions, as in the end of  
the same Booke are adioyn-  
ed, touching y<sup>e</sup> chiefe  
officers of the  
fieldes.



# The seconde Booke.

¶ A briefe Treatise of that part of  
Algebra that concerneth Cossicall,  
or *Denominate Numbers*.

## CHAP. I.



**I**n common Arithmetike all Abstract numbers take their originall from the Vnite, so in these kinde of concrete or Denominate numbers, we take oure beginning from a *Radix* or Roote, not improperlie so termed, sithens out of the same, as from the verie base and roote are deriued infinite bzaunches of these Cossicall numbers. And as in common numbers we procede from the Vnite by Addition, to create all kinde of Numbers, so in this Arte of Numbers Cossicall, we procede from the Roote by Multiplication, to create all Squares, Cubes, Zenzizenzike, and Surd Solides, wyth all other that in this Science are vsed, the whyche by Example maye best bee explained.

1	2	3	4	5	6	7	8	9	10	11	12
Roo.	Sq.	Cu.	SqS.	Sfo.	SqC.	BfS.	SSSq.	CC.	SfS.	CfS.	SSC.
2	4	8	16	32	64	128	256	512	1024	2048	4096

Any Number Abstract may bee a Roote, and according to the value and quantitie thereof, all the other Cossicke Numbers in value and quantitie alter. For Example sake, I do heere suppose the Roote 2, the whiche multiplied in it selfe, maketh 4 his Square, with his Character ouer hys  
I,
head,

head, that *Sq.* augmented againe in his Roote, maketh 8 his Cube, and his Character ouer his head. Of these are all the rest componed. For the Square being four, againe squared, maketh his Squared Square 16, with his Character ouer him. The next being not made by the Square or Cubike, Multiplication of any of the former, can not take his name from Square or Cube, and is therefore called a Surd solide, and is onely created by Multiplication of 2 the Roote, in 16 the *Sq.S.* making 32 with his conuenient Character ouer him, & for distinctiō is tearmed the first Surd solide. Again, 8 being the *Cu.* squared, maketh 64, the next number ensuing in Geometricall Progression, with his Character componed of *Sq.* and *Cu.* called a Squared Cube, the next being 128, is not made of Square or Cubike Multiplication of any, but only by the Multiplication of the Squared Cube in his Roote, and therefore is tearmed the B.S. solide, or seconde S. solide.

Hereof you maye collecte this Rule vniuersall, to giue name to any of these Cossicall Solides, consider what simple or vncomponed numbers the number of the Solide may be resolued into, and of the Characters, to those Numbers apperteyning he shall be componed.

#### Example.

Of the first Cossicall number, 6 is componed of 2 and 3, 2 is the *Sq.* 3 the *Cu.* I conclude therefore the first is a *S. Cube*, likewise of the eyght, 8 is made of 2, 2 and 2 therefore I inferre, that the eyght Character shal be a *S.S. Square*. Again, 10 is made of 2, and 5 a *S S*, the tenth therefore shal be a *Sq.S Solide*, and thus of all other.

This I haue rather added for custome sake, bycause in all parts of the world these Characters and names of *Sq.* and *Cu.* &c. are vsed, but bycause I find another kinde of Character by my Father deuised, farre more readie in Multiplications, Diuisions, and other Cossicall operations, I will not doubt, hauing Reason on my side, to dissent from common custome



In this poynt, and vse these *Characters* ensuing :

H H A X T Y O P.

H for a *Roote*, H for a *Square*, A for a *Cube*, X for a *Squared Square*, X for a *S. Solide*, T for a *Squared Cu.* and so of the rest, vsing only the ordinarie *Figures*, but somewhat turned a contrarie way, bycause they should be discerned, and not confused among others, and these shall be named *Primes*, *Seconds*, *Thirds*, *Fourths* &c. according to their *Figure* or *Character*.

## Of Addition of Numbers Cossicall.

### Chapter. 2.

**W**hen Numbers Cossicall are presented to be added, eyther it is of one or of mo, of one thus. I would adde 5 H to 20 H in this case the Characters being like, you shall only adde the Numbers adioyning to the Character, so find yee that those two Cossicall numbers ioyned, make 25 H but if the Characters be differente, as 10 H to be added to 16 A, then shall you ioyne them with this signe + Plus, saying they make added 10 H + 16 A, that is to saye 10 secondes more 16 thirds : for being of different Characters, they cannot be otherwise expressed, but if they be many to be added together, then shall you dispose them one vnder another, matching always like Characters together. For Example, I would adde 20 H + 30 H + 25 X vnto 45 H + 16 H + 13 A.

In Addition of these kind of numbers, I begin from the left hand, saying 20 and 45 make 65, whereto I adioyne their common Character H. Likewise 30 and 16 make 46, I adioyne H their common Character.

$$\begin{array}{r}
 20 \text{ H} + 30 \text{ H} + 25 \text{ X} \\
 45 \text{ H} + 16 \text{ H} + 13 \text{ A} \\
 \hline
 65 \text{ H} + 46 \text{ H} + 25 \text{ X} + 13 \text{ A}
 \end{array}$$

And bycause these nũbers are both noted with this signe +, I adde also that Signe. Last of all, bycause 25 and 13 doe differ

J. y.

differ in Character, I may not adde their numbers, as in the other, but put them downe with the signe + as in the Example you may behold.

Againe, it happeneth sometime, that albeit the Characters agree, yet the Signes differ, as in this second Example.

$$\begin{array}{r} 10 \text{ } \text{H} + 25 \text{ } \text{H} - 12 \text{ } \text{X} \\ 13 \text{ } \text{H} - 22 \text{ } \text{H} + 16 \text{ } \text{X} \\ \hline 23 \text{ } \text{H} + 3 \text{ } \text{H} + 4 \text{ } \text{X} \end{array}$$

Here first 10  $\text{H}$  and 13  $\text{H}$  make 23  $\text{H}$ , but because in the next the Signes are differente, I must deduct the lesse from the bigger, so remaineth 3, to the whiche I adde + viz. the Signe of the greater number. Againe, the next having different Signes, I subtract the lesse out of the greater, there remaineth 4  $\text{X}$  whereto I annex + being the Signe of the greater. And thus the Addition appeareth to be 23 Primes + 3 seconds + 4  $\text{X}$ . Here is all the difficultie in this kind to vse Subtraction, when the Signes differ, and set downe the Signe of the greater, the whiche in one shorte sentence is expressed by Scyfelius.

*Diuersa Signa commutant speciem, Aponit M.*

One Example more I thinke good to adioyne, to remoue all scruple or doubt that may arise. These Operations conferred with the Rules of Addition ensuing, are manifest, and neede no farther Explanation.

$$\begin{array}{r} 4 \text{ } \text{A} + 25 \text{ } \text{H} - 13 \text{ } \text{H} \\ 6 \text{ } \text{X} - 20 \text{ } \text{H} + 12 \text{ } \text{X} \\ \hline 4 \text{ } \text{A} + 6 \text{ } \text{X} + 5 \text{ } \text{H} + 12 \text{ } \text{X} - 13 \text{ } \text{H} \end{array}$$

*The rules of Addition.*

If the Signes be like subscribe the same Signe.

If unlike Subtract, and to the Remaine adioyne the greater Numbers Signe.

## Of Subtraction. Chap. 3.

**L**ike different difficulties are also in Subtraction, but by one example containing everie particular varietie that can chaunce, I thinke better briefly to teache, than by vsing many wordes in euident matters to be tedious.

## The rules of Subtraction.

**L**ike Signes produce their like, except the greater nūber be from the lesse to be subtract, then change the Signe & set downe thereto the Difference.

Contrarie Signes in steade of Subtraction, requireth Addition, and to the Product adde the vpper numbers Signe.

$$8 \text{ } \text{℥} + 12 \text{ } \text{℥}$$

$$4 \text{ } \text{℥} + 10 \text{ } \text{℥}$$

$$4 \text{ } \text{℥} + 2 \text{ } \text{℥}$$

$$8 \text{ } \text{℥} - 2 \text{ } \text{℥}$$

$$2 \text{ } \text{℥} + 2 \text{ } \text{℥}$$

$$6 \text{ } \text{℥} - 4 \text{ } \text{℥}$$

$$-7 \text{ } \text{℥} + 10 \text{ } \text{℥}$$

$$+5 \text{ } \text{℥} + 12 \text{ } \text{℥}$$

$$-12 \text{ } \text{℥} - 2 \text{ } \text{℥}$$

**B**ehold in these three Examples ye haue as many varieties as in Subtraction can happen, wherein this is to be noted, that howsoever the nūbers are beluered, ye may alter and transpose them, so as like Characters be matched together, alwayes keeping with them their conuenient Signes, and placing alwayes the number to be subtracted vnder, and the other aboue. In the first Example we see the Signes alike, deduct therefore one from the other, there remaineth first  $+4 \text{ } \text{℥}$  and in the seconde  $+2 \text{ } \text{℥}$ . But in the second part of the second Example, the Signes are different. In steade therefore of Subtracting I adde, so amounteth  $4 \text{ } \text{℥}$  whereto I adioyne the Signe  $-$  because it is the vpper numbers Signe. Again in the third, because the Signes are diuerse in the first part by Addition I finde  $-12 \text{ } \text{℥}$ . But in the seconde part albeit the Signes be one yet the greater nūber being vnder, I adioyne a contrarie Signe to the difference, saying the remaine is  $-2 \text{ } \text{℥}$ . And thus of al others.



## Of Multiplication. Chap. 4.

**F**or Multiplication of Cossike numbers ye shall ad together their Charecters, and the resulting Character, set downe with the number produced of their numbers Multiplication, and for the Signes these Rules ensuing must be obserued.

The same or like Signes multiplied produce + *Plus*.  
Contrarie or diuerse Signes produce alway — *Minus*.

**E**very seuerall number of the Multiplier must be augmented in euery number of the number to be multiplied, and the Products with their correspondent Signes and Characters so placed, that like Characters be matched, and finally by Addition the whole collected.

Beholde the Example.

First I say 6 times 4 makes 24 and *Primes* added to Thirde make Fourthes. I set downe therefore 24  $\times$ . Again 6 times 12 make 72 and *Primes* added to Secondes, make 3 I sette downe therefore 72 Thirde, and in both these numbers the Signes being like, I sette downe +

$$\begin{array}{r}
 4 \times + 12 \psi - 4 \psi \\
 6 \psi + 12 \times - 3 \times \\
 \hline
 + 48 \times + 24 \times + 72 \times - 24 \psi + 144 \times - 12 \psi \\
 - 36 \times - 48 \times \qquad \qquad \qquad + 12 \times \\
 \hline
 24 \times - 24 \times + 72 \times - 24 \psi + 156 \times - 12 \psi
 \end{array}$$

Agayn 6  $\psi$  in 4  $\psi$  make 24  $\psi$ , but bycause the Signes are different I adde to those 24  $\psi$  the Signe —. This done, I dash 6 with the penne, and goe to the next Section or member of my Multiplier *Viz.* 12  $\times$  saying 12  $\times$  in 4  $\times$  Produce 48 Sixs, I set downe therefore + 48  $\times$ . Again 12  $\times$

in 12  $\text{v}$  produceth 144  $\times$  the Signes being like  $\text{I}$  adioyne +  
 Againe 12  $\text{v}$  in 4  $\text{v}$  maketh 48  $\times$  and the Signes beyng  
 unlike  $\text{I}$  set downe —. This 48  $\times$   $\text{I}$  set directyre vnder 24  
 $\times$  in the vpper lyne. Againe dashing out 12  $\text{v}$   $\text{I}$  say 3  $\times$   
 in 4  $\text{v}$  makes 12  $\text{v}$  the which sette in the vpmost line by  
 cause there is none his like to set him vnder.

Againe 3  $\times$  in 12  $\text{v}$  maketh 36  $\times$  which  $\text{I}$  subscribe vn-  
 der the Sixtes in the vpper line adding the Signe — bycause  
 the Signes are diuerse.

Finally 3  $\times$  in 4  $\text{v}$  make 12  $\times$  the which  $\text{I}$  sette vnder  
 the Fiftes in the firste row, adioyning the Signe +, bycause  
 both their Signes be like. And so drawing a lyne by Addi-  
 tion,  $\text{I}$  finde the Product of that multiplication 24  $\times$  + 156  
 $\times$  + 72  $\text{v}$  — 24  $\times$  — 24  $\text{v}$  — 12  $\text{v}$ . In like sort of al other,  
 for no other change can happen that you are not instructed  
 in by this Example.

### Of Diuision. Chap. 5.

**T**He Diuision of numbers Cossical is not vnlike to the  
 Diuision of common numbers in respect of placing  
 the Diuisor, and as in Multiplication the name to the  
 Character resulting was giuen by adding together the two  
 Characters of the multipler and multiplied number, so  
 here the Character of the Quotient is founde Subtracting  
 the Character of the Diuisor from the Character of the Di-  
 uidente, as by the Example ensuing moze plainly appea-  
 reth: the Rule of the Signes is al one in Diuision with those  
 of Multiplication.

Like

Like Signes giue +, Vnlike —.

The Number diuisible.  $60 \times + 72 \div - 80 \times - 96 \div | 6 \div - 8 \div$  Quotient.

The Diuisor.

$10 \div + 12 \div$

$60 \times + 72 \div$

The Numbers thus digested, I search how oft 10 in 60, I find 6 which I put in the Quotient adding this Character Seconds, bycause Thirdes from Fiftes leaue Seconds, that Quotient multiplied in my whole Diuisor, maketh  $60 \times + 72 \div$  which Deducted from the Diuisible, leaueth 0. I remoue my Diuisor to the next, searching again how oft 10 in 80 I finde 8, the whiche I put in the Quotient with hys Character  $\div$  bycause 3 from 4 leaues 1. And so, as much as the Characters are vnlike I set downe — multiply therefore  $- 8 \div$  in that Diuisor, there resulteth  $80 \times - 96 \div$  the which Deducted from the Diuisible leaueth nothing, I conclude therefore  $6 \div - 8 \div$  my Quotient. The which I may proue whether it be true two wayes, epyther multiplying the Diuisor with this Quotient so shall you produce the Diuisible number. Or diuiding the same Diuisible by your Quotient so shal your first Diuisor in the newe Quotient be created.

Example.

$$\begin{array}{r} 60 \times - 80 \times + 72 \div - 96 \div | 10 \div + 12 \div \\ 6 \div - 8 \div \quad \quad 6 \div - 8 \div \hline \end{array}$$

I finde 6 in 60 contayned iust 10 times. But 10 in the Quotient with the Character  $\div$  bycause 2 out of 5 leaueth 3. Powe 10  $\div$  multiplied in the Diuisor maketh  $60 \times - 80 \times$  which Deducted from the corresponding parte of the Diuisible leaueth 0. The Diuisor remoued I searche againe howe ofte 6 in 72, I finde iust 12, that I put in the Quotient with the Character  $\div$  Primes, bycause 2 from 3 leaueth 1, and the Signes being like, I adde + thys 12 multiplied



plied in 6  $\text{sh}$  — 8  $\text{d}$  createth 72  $\text{d}$  — 96  $\text{d}$  whiche deducted from the seconde parte of the Diuisible number, leaueth 0. Thus haue ye in the Quotient broughte forth your first Diuisor, & therfoze are assured, both your works agreeing, & you haue not erred. But if it happen that epther the Characters agree not, or the Signes and numbers so repugne as ye can not vse this ordinarie course of Diuision, then place them as a Fraction, drawing a line, and setting the Diuisible aboue, & the Diuisor vnderneath. These kind of Cossical Fractions haue their peculiar Rules, which shal hereafter ensue briefly, and so to Equation.

## Of Fractions Cossical. Chap. 6.

**T**He selfe same Rules that were taught for Addition, Subtraction, Multiplication, and Diuision of common Fractions, serue also in these Cossical Fragments, as by these Examples ensuing shal appeare.

### Examples of Addition.

*The numbers Added.*

$$\begin{array}{r|l} 36 \text{d} + 16 \text{s} & 9 \text{sh} + 4 \text{d} \\ \hline 12 \text{s} & 3 \text{d} \end{array} \quad \text{Added } 6 \text{sh} - 3 \text{d} \quad \begin{array}{r|l} 18 \text{s} - 9 \text{s} & \\ \hline & 12 \text{s} \end{array}$$

*The Product.*  $\frac{18 \text{s} + 36 \text{d} + 7 \text{s}}{12 \text{s}}$

**M**ultiply the Denominators, so haue ye 12  $\text{s}$  the common Denominator, then crosse Multiplication of 4  $\text{d}$  in 9  $\text{sh} + 4 \text{d}$  makes 36  $\text{d} + 16 \text{s}$ , and 3  $\text{d}$  in 6  $\text{sh} - 3 \text{d}$  makes 18  $\text{s} - 9 \text{s}$ . These added make this Fraction,

$$\frac{18 \text{s} + 36 \text{d} + 7 \text{s}}{12 \text{s}}$$

G.

Examples

## Examples of Subtraction.

*The Fraction  
subduced.*

$$\begin{array}{r|l} 16\alpha + 24\chi & 4\psi + 6\psi \text{ Deducted } 2\psi - 2\psi \\ \hline 32\chi & 8\alpha \text{ from } 4\psi \\ \hline & 24\chi - 16\alpha - 40\chi \text{ The Remayne.} \\ & 32\chi \end{array}$$

## Examples of Multiplication.

$$\begin{array}{r} 6\psi + 2\alpha \text{ Multiplied by } 10\chi \text{ Produces } 60\chi + 30\psi \\ \hline 4 \qquad \qquad \qquad 8\psi \qquad \qquad \qquad 32\psi \\ 5\psi + 32\alpha \text{ Mul. } 8\alpha + 10\psi \text{ Produ- } 256\chi + 360\chi + 50\chi \\ \hline 7\alpha - 20\psi \text{ by } 6\psi - 28\alpha \text{ ceth. } 602\chi - 196\chi - 120\psi \end{array}$$

## Examples of Division.

$$\begin{array}{r} \text{By } 4\psi \text{ I wald divide } 16\chi + 15\psi \text{ arifeth of that } + 8\chi + 45\psi \\ \hline 3 \qquad \qquad \qquad 9\psi \qquad \qquad \text{Division} \qquad \qquad 36\alpha \\ \hline \text{The Divi. } 10\psi \text{ The num. to } 12\psi + 4 \text{ The Quo- } 192\psi + 64 \\ \hline 10 \text{ be divided. } 12\psi \text{ tient. } 120\alpha \end{array}$$

These Examples are wrought even in like sort & forme as the Fractions of Abstract Numbers, and their multiplication in respect of Signes and Characters, nothing differeth from that whiche alreadye hath bene declared in Integers Cossical.

FOR examination of al these kindes as wel Integers Cossical as Fragments, this one Rule sufficeth. Admit any nūber what ye list for a *Roote* or *Prime*, and thereby set downe in Abstract numbers the value of euerye other Cossical nūber.

Then

Then with those *Abstract* numbers adde, *Subtract*, multiply or diuide, and conferre the *Productes* with *Cosſical* numbers produced by these foretaught *Operatiōs*. If they agree, it sheweth a verity. If ye finde repugnance, Repetition in either kind discouereth where the error resteth.

### Of Reduction. Chap. 7.

**R**eduction is two wayes vnderstand, eyther to Reduce a Fraction to his least Denomination, or else to Reduce two Fractions of diuerſe Denominations to one & the same Denomination.

The first is performed by diuiding both Numerator and Denominator by the greatest common Diuisor that may be founde.

The latter by crosse Multiplication of the Numerator of one in the Denominator of the other, wherby resulteth new Numerators, and then multiplying the Denominators one in another, is produced the common Denominator.

Example.

I desire to reduce  $\frac{16 \times}{12 \times}$  to a lesser Denomination, I diuide therefore both Numerator and Denominator by 4  $\times$  so ariseth this Fraction  $\frac{4 \times}{3}$  Equal to the former Fraction. Or if it happen that diuerſe Fractions be coupled together by + or - diuide euery member seuerallye by the greatest common Diuisor. Thus:  $\frac{16 \times}{12 \times} + \frac{15 \times}{12 \times}$  is Reduced to  $\frac{4 \times}{3} + \frac{5 \times}{4}$  diuiding the first number of the Fraction by 4  $\times$  and the latter part by 3  $\times$ . And thus of al such like.

The latter kinde of Reduction by crosse Multiplication is already shewed in the Examples of Addition: but for more playnesse I wil giue one other Example.

Ex.

Ex.



$\frac{12 \text{ } \mathfrak{A}}{3 \text{ } \mathfrak{H}}$  and  $\frac{8 \text{ } \mathfrak{X}}{4 \text{ } \mathfrak{H}}$  Reduced to one Denomi- }  $\frac{48 \text{ } \mathfrak{X}}{12 \text{ } \mathfrak{A}}$   $\frac{24 \text{ } \mathfrak{X}}{12 \text{ } \mathfrak{A}}$   
 nation stande thus.

Here  $3 \text{ } \mathfrak{H}$  multiplied in  $4 \text{ } \mathfrak{H}$  make  $12 \text{ } \mathfrak{A}$  the cōmon De-  
 nominator, and  $12 \text{ } \mathfrak{A}$  multiplied crosse in  $4 \text{ } \mathfrak{H}$  maketh  
 $48 \text{ } \mathfrak{X}$ . Likewise  $8 \text{ } \mathfrak{X}$  in  $3 \text{ } \mathfrak{H}$  augmented, createth  $24 \text{ } \mathfrak{X}$  so  
 are the two proponed Fractions reduced  $\frac{48 \text{ } \mathfrak{X}}{12 \text{ } \mathfrak{A}}$  being as  
 much as  $\frac{12 \text{ } \mathfrak{A}}{3 \text{ } \mathfrak{H}}$  and  $\frac{24 \text{ } \mathfrak{X}}{12 \text{ } \mathfrak{A}}$  no lesse then  $\frac{8 \text{ } \mathfrak{X}}{4 \text{ } \mathfrak{H}}$  and betwēne  
 themselves of equal Denomination. This Rule is vniuer-  
 fall for al Fractions, of how manye Sections oꝝ members  
 soeuer they consist. Now to *Equations*.

### Of Aequations.

*Aequation* is nothing else but a certain conference of two  
 numbers being in value Equal, and yet in multitude and  
 Denomination different.

As we maye say 1 Pounce is Equal to 20 shillings, oꝝ 3  
 Pounds equal to 12 Crownes, oꝝ  $4 \text{ } \mathfrak{H}$  is Equal to  $8 \text{ } \mathfrak{H}$  oꝝ  $3 \text{ } \mathfrak{A}$   
 is Equal to  $6 \text{ } \mathfrak{H}$ . In all these their value agrē, albeit the  
 numbers and Denominators oꝝ Characters be diuerse. Of  
 these *Aequations* I will speake the moze particularlye, soꝝ  
 that all the Operations of *Algebra* tende to this finall ende,  
 to frame an *Aequation*, and then thereby to search the Va-  
 lue of the Roote, oꝝ *Prime*, wherby the most difficult Que-  
 stions that maye arise oꝝ be proponed, are wpth farre  
 moze facilitie to be resolued, than by anye other Rules  
 whatsoeuer.

Of

## Of Reduction of Equations.

**T**he Reduction which is sought in Equatiō, is to bring one part of the Equation, to one simple Cossicall number viz.  $1 \text{ } \mathcal{H}$ ,  $1 \text{ } \mathcal{H}$ ,  $1 \text{ } \mathcal{X}$ , or so forth, the which is done two wayes.

First, by transposing or remouing of numbers from one part, to the other.

Then by reducing those numbers so transposed, to they least Denomination, or if they be Fractions, to an Integer.

## Of transporting of numbers in Equations.

**T**his is a Rule generall, euerie number transposed changeth his Signe, as if I say  $10 \text{ } \mathcal{H} + 4$  are Equall to  $3 \text{ } \mathcal{X}$ , I may trāsferre 4 to  $3 \text{ } \mathcal{X}$ , & say  $10 \text{ } \mathcal{H}$  are Equall to  $3 \text{ } \mathcal{X} - 4$ . Likewise, as  $2 \text{ } \mathcal{H} + 10 \text{ } \mathcal{H}$  are equall to  $3 \text{ } \mathcal{X} - 6$ , so is  $2 \text{ } \mathcal{H}$  equall vnto  $3 \text{ } \mathcal{X} - 6 - 10 \text{ } \mathcal{H}$ , and this for transporting of Signes sufficeth, whereby alway you may reduce one side of the Equation, to one particular Cossicall Number.

This kinde of Reduction by transportation, must be so ordered, that you single by himselfe the greatest Character, so as the same may stande solitarie on the one side, and the lesser Characters frame the cōtrarie part of the Equation.

## Of Reduction of the parts of an Equation, to their least Denomination.

**O**ne part of the Equation being reduced by transportation of numbers, to one simple Cossicall Character, To reduce the Equation to a lesser Denominatiō, you shal diuide epyther part by some common Diuisor, the greatest you can finde.

As if  $3 \text{ } \mathcal{X}$  be equall to  $12 \text{ } \mathcal{H} - 9 \text{ } \mathcal{H}$  diuiding by  $3 \text{ } \mathcal{H}$  I find  $1 \text{ } \mathcal{H}$  Equall to  $4 \text{ } \mathcal{H} - 3$ .

*Ex. 1.*

Sometime

Sometime it shall be requisite to take away some number from eyther part of the Equation, as if I haue 6  $\text{H}$  Equall to 12  $\text{H}$  — 24, deducting from eyther part of the Equation 6  $\text{H}$ , there resteth  $\text{H}$  Equall to 6  $\text{H}$  — 24, and therefore of necessitie 6  $\text{H}$  is equall to 24, for this Rule is general. That if you bring an Equation (by suche Deduction) to a  $\text{H}$  on the one part, there must be some member in the other connered with the Signe Minus, the whiche is alwayes Equall to all the rest of that part of the Equation.

Sometimes Reduction is made by adding together all suche parcels, as on the one side of the Equation haue equal Characters, as if 1  $\text{X}$  be Equal to 3  $\text{A}$  + 16  $\text{H}$  — 1  $\text{H}$  — 10  $\text{H}$ . Where by adding +16  $\text{H}$  to —10  $\text{H}$ , there resulteth +6  $\text{H}$ , so that I say 1  $\text{X}$  is equall to 3  $\text{A}$  + 6  $\text{H}$  — 1  $\text{H}$ , and  $\text{H}$  same diuided by 1  $\text{H}$  maketh 1  $\text{X}$  Equal to 3  $\text{H}$  + 6 — 1  $\text{H}$ .

### Reduction of Fragments vvhich shall happen in Equations to Integers.

**A**nother kinde of Reduction there is of Fragmentes to whole numbers, whiche commeth in vse when an Equation is founde betwene Fractions on the one or both parts, as if  $\frac{4\text{H} + 2\text{A}}{2\text{H}}$  be Equall vnto  $\frac{3\text{A} - 2\text{H}}{1\text{H}}$ , by crosse

multiplication of the Denominator of the one in the Numerator of the other, I finde these two numbers produced 4  $\text{A}$  + 2  $\text{H}$ , and 6  $\text{H}$  — 4  $\text{A}$ . Betwene these, the like Equation remaineth, and the same first reduced by transporting of Signes, maketh 4  $\text{A}$  Equall to 6  $\text{H}$  — 2  $\text{H}$  — 4  $\text{A}$ . Then by Addition of 6  $\text{H}$  to — 2  $\text{H}$ , there resulteth 4  $\text{H}$  — 4  $\text{A}$ , equall to 4  $\text{A}$ . Againe, diuiding either part of the Equation by 4  $\text{H}$ , there resulteth 1  $\text{H}$  Equall to 1  $\text{H}$  — 1  $\text{H}$ . And last of all, deducting 1  $\text{H}$  from both partes of the Equation, I find  $\text{H}$  equall to 1  $\text{H}$  — 2  $\text{H}$ , and therefore of necessity as was declared.



Declared before 1  $\frac{1}{2}$ , Equall to 2  $\frac{1}{2}$ . Thus of that intricate Fraction, you see how we haue by the former Rules produced this playne and facile Equation. These Examples well laboured, will make all Equations familiar.

The demonstration of all these rules, hang on the thirde common sentence, and the fiftenth Proposition of the fifth Booke of the Elements of Geometrie.

## The Rule of Coss. or Algebra.

### Chapter. 8.

**T**His Rule is of suche perfection, that it perfourmeth not onely whatsoeuer maye be done by the rule of *Proportion*, the rule of false *Positions*, the rule of *Allegation*, the Rules of *Archindus*, fixe quantities of *Cataym*, or of any or all other Rules that euer haue bin inuented, but also with such facilitie and sensible *Methode* proceedeth in all his operations, that it may well be accounted the *Prince* and *Gouernesse* of al other. Leauing therfore to wast words in such by branches, I will bring thee to the *Founsayne* head, whence all other Rules, as particular Channells are deriued. The Rule ensueth.

### The Rule.

**F**Or the number sought, set downe 1  $\frac{1}{2}$ , then proceede in youre Arithmetically workings, according to the forme and nature of the question, till you come to some Equation, the which being reduced, as is before taught, you shall by the number of that parte of the Equation, whyche consisteth of one sole Cossicall, diuide the other parte of the Equation only, if youre sole Character be  $\frac{1}{2}$ . Or from the same extract such a Roote, as the Character of your solitarie side demonstrateth. The first Quotient or Roote thereof, shall be the vnknown or desired Number.

Example.

## Example.

This Rule can not be better explained, than by example. Admitte therefore I am demaunded what number that should be, whose third and fourth partes ioyned, maketh 14. According to the rule I say, it is 1  $\#$  viz. one Prime, or one Roote, as commonlpe Algebricians tearme it. Powe the whole running resteth in discovering the value of this Prime or Roote.

I reason therefore thus, if the number I seeke bee one Prime, then is  $\frac{1}{3}$  and  $\frac{1}{4}$  of a Prime added together 14, but  $\frac{1}{3}$   $\#$ ,  $\frac{1}{4}$   $\#$  added, maketh  $\frac{7}{12}$   $\#$  therefore is  $\frac{7}{12}$   $\#$  equall to 14. Behold an Equation, the which bycause it is already simple and neede no Reduction, according to this Rule with  $\frac{7}{12}$  bee- ing the number of my solitarie Character, I divide 14, the other part of my Equation. Of this Diuisiō, resulteth 24, I conclude therefore 24 to be the number sought, whose third and fourth parte added, shoulde make 14. In this Equation, bycause the solitarie Character is  $\#$ , the quotient of the Diuision discovereth the number sought, but if the solitarie Character had bin  $\frac{1}{2}$ , then shoulde you haue extracted from youre Quotient 14 his Quadrate Roote, if  $\frac{2}{3}$  the Cubike Roote.

## Another Question.

There is a bande of Souldyours armed with three sortes of Weapon, Pikes, Halberdes, and Shot. The Halberdes and Shotte put togyther, are double so manye as the Pykes, and the Pykes and Shotte togyther, are eyght times so manie as the Halberds. And the Shot by themselues alone, are in number more than both the other weapons by 55. I demaund the number of Souldiers in that band, and the number of euerie sort of weapon.

For the number of the Halberdes, I put 1  $\#$ , then must both the other weapons togyther be 8  $\#$ , being by Supposition 8 times so many, and the Pikemen 3  $\#$ , for so dothe the  
residue

residue (being 5  $\text{H}$  for the Shotte, added to 1  $\text{H}$  for the Halberds) become double to 3  $\text{H}$  the Halberds by Supposition, Now seeing in my questiō it is sayd, that the Shot are more than both the rest by 55, I adde 1  $\text{H}$  my Halberds, to 3  $\text{H}$  my Pikes, there ariseth 4  $\text{H}$ , whiche deducted from 5  $\text{H}$ , the Shot leaueth 1  $\text{H}$  Equall to 55. Thus haue I an Equation. Nowe diuiding 55 by 1, the number of the solitarie Character, there ariseth in the Quotient againe 55. I conclude therefore 1  $\text{H}$  to be 55, and so 55 Halberdiers in that band. When the Pikes being 3  $\text{H}$ , must be 155, and the Shot being 5  $\text{H}$  are 275. All these added together, make 495, thus finde I five hundred Souldiers saue five to be in the whole Band. But bycause such Equations many times shal happen, as the solitarie Signe shall be a  $\text{H}$ , I will in the next Chapter shew how to extracte the Quadrate Roote of sundrie sorts of Equations.

### Hovve to extract the second Radix or

Quadrate roote of any *Cossicall* numbers, arising in any Equations.

Chap. 9.

**I**nasmuch as already in Reduction, I haue taught so to order the Equation, that the Characters of the second part of the Equation shall alway be lesse than the singled Character. This is most certaine, that the extraction of the Second Roote, or square Radix of Cossicall Numbers, is neuer in any Arithmetical operation necessarie, saue onely of these varieties following.

To finde the Quadrate  
or seconde Radix of

{ A Number alone  
   $\text{H}$  or Rootes onely.  
   $\text{H}$  + Numbers.  
  Numbers -  $\text{H}$ .  
   $\text{H}$  - Numbers.

**I**.

**These**



These are the only fine varieties, wherein the extraction of Rootes Quadrate in these Cossicall Equations are required, and for euerie of these brieft Rules shall ensue.

### Rules.

1 For the firste, I referre you onely to the first Booke of my Fathers, where you are taught out of anye abstracte or simple number or Fraction, to extract his Square *Radix*.

2 In the seconde, the number it selfe that is with the rootes coupled, is the number or *Radix* desired.

3 In the third, you shall take the moytie of the number of  $\sqrt{\quad}$  or Rootes.

This moytie square, adde the same to the Number Abstract in your Equation.

To the Quadrate *Radix* of that Producte, adioyne the moytie first vsed.

The Number resulting of this last Addition, is youre desired *Radix*.

4 In the fourth, set downe (as before) the moytie of the  $\sqrt{\quad}$  number that *N*. Square. That Square adde to the number Abstract, and from the roote Quadrate of the Product, deduct the moytie first set downe. This Remyne is the desired Roote.

5 In the fifth kind there is alway two Rootes, vnlesse the moitie of the  $\sqrt{\quad}$  squared, be equall to the number Abstract, for then is the moitie of the  $\sqrt{\quad}$  number the *Radix* soughte. But howsoeuer that fall out, you shall as before reserue the moytie of the Primes, first squaring the same, and from that Square, deducting the Abstract number. The Roote Quadrate of the Remynder, added to youre reserued moytie, maketh the greater *Radix*, the same quadrate roote deducted from the moytie reserued, leaueth the lesser *Radix*.

The first and second of these Rules, being of themselves manifest, neede no farther Explanation. Of the other three, particular Examples shall ensue.

Example

## Example of the third Rule.

$$1 \sqrt[4]{\text{Æ} 6 \text{H} + 27}$$

Admitte this Equation  $1 \sqrt[4]{\text{Æ} 6 \text{H} + 27}$ . The Moytie of 6 is 3, that Squared, is 9, which added to 27, maketh 36, the Roote Square of that is 6, whereto adioynning 3, the Moytie first used, I make 9, the Radix of that Equation.

## Example of the fourth Rule.

$$1 \sqrt[4]{\text{Æ} 80 - 2 \text{H}}$$

Hære you are to Extract the Square Roote of 80 lesse 2 Primes or Rootes. The moytie of 2 is 1, that Squared maketh 1, this added to the abstract number, maketh 81 hys Roote square is 9, from that I deduct 1 my firste moytie, so resteth 8, the Radix of that Equation.

## Example of the fifth Rule.

$$1 \sqrt[4]{\text{Æ} 14 \text{H} - 33}$$

The Moytie of the number of Primes is 7, that squared, maketh 49, from this I deduct 33, the abstract number, resteth 16, whose Roote 4 added to 7, the Moytie Fundamentall, maketh 11, the greater Roote, deduct the same 4 from 7, resteth 3 the lesser Radix. The truth whereof is thus apparant, square 11 ariseth 121, the Square which shoulde be equall to 14 Rootes lesse 33, 14 times 11 maketh 154 the number of the Rootes, from this deduct 33, the abstract number resteth 121 your Square. In like sort, the lesser Roote 3 squared, maketh 9. Now 14 of these Rootes are 42, from whiche deduct 33 resteth 9 the Square. And heereby it is manifest, that both the one and the other are true Rootes of this Equation, and moe than these it is impossible to finde.

## A M A S I A S.

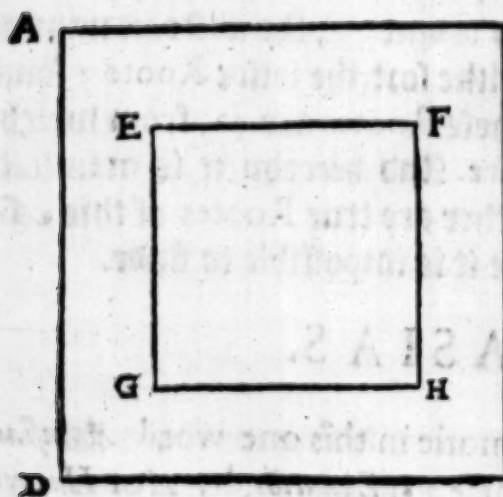
**S** Tyfelius for ayde of memorie in this one word *Amasias*, representeth the rules of these 3 Equations, by *A* or *Ha*, we  
Hij. may

may remember the firste halfe or *Moytie*, the foundation of all the operations, and therefore may be tearmed the *Moitie Fundamental*. *M* signifyeth *Multiplication* of that moytie in it selfe, whiche I name *Squaring*. *A* and *S* *Addition* and *Subtraction*, viz. in the two former *Aequatiōs*, to adde the *Square* of the *Moitie* to the abstract number, In the last to *Subtract* the one from the other, *I*, signifieth the *Inuentiō* of the *Square* Roote of the *Product* or *Remayne*, then *A* and *S* agayne admonisheth *Addition* or *Subtraction* of this *Roote* to be made too or from the *Moitie Fundamental*, in forme as the *Signe* of that *Moitie* declareth.

### Questions concerning the office of the Serieant Maior. Chap. 10.

#### *The first Question.*

**H**ere is deliuered to the Serieant Maior 60 Ensignes, in euerie Ensigne 160 Pikes, and short weapon. The Generals pleasure is, that he shall put them into one mayne Squadrone, and to arme it rounde with seauen ranckes of Pikes, I demaund how many Pikes, how many Halberds, he shall vse to make the greatest Squadrone, and howe many Ranckes shall be in that Battayle.



For resolution of this demaund, first I set downe in Portrayte the forme of the Battayle here represented, by A B C D. The Squadrone of short weapon E F G H. The residue representing the seauen Ranckes of the Armed Pikes. Seeing therefore I haue 60 Ensignes, and in euerie Ensigne 160 of Pikes & short weapon.



I multiply 160 by 60, resulteth 9600 the number of men deliuered to be Embattelled. Now since I am demaunded the number of eyther weapon, and also the number of Rankes represented by the lyne A D or A B, I saye that is 14 according to the Rule of Cosse. This multiplied in it self, maketh 196 the Square A B C D, the whiche is Equal to 9600 the number of men to be imbattelled. Thus am I come to this Equation 196 = 9600. The greatest Roote of Integers is 97, the lyne A D or A B *Viz.* the number of Rankes,

Now considering E F the side of the Squadron of shorte weapon is 14 lesse: (being armed round, which 7 Rankes of Pikes.) I Deduct 14 out of 97, remayneth 83 the side E F, whose Square is 6889 the number of the Short weapō, and that Deducted from 9409, the Square of 97, leaueth 2520 the number of Pikes. Thus I finde a Resolution of the demaundes as followeth.

The Number of Pykes.	{ 2520	The number of Shorte weapon.	{ 6889	Rankes in all.	{ 97	Rankes of Short weapon.	{ 83
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## The second Question.

THE high *Marshal* commaundeth that the Army shall be diuided into 3 like square Battels, euery Battayle to bee Armed in the fronte with 7 Rankes of Pikes, and that these battels making one fronte vppon the Enimie be empaled on eyther side with a sleeue of Pikes of 5 in a ranke. This order being prescribed, he deliuereth the *Serieant Maior*, 18000 *Souldiours* pikes and short weapō, commaunding that the *Squadrons* be made as greate as possible may be of those men. It is demaunded how manye in euerye ranke of the *Battallions*, and in what sort the *Serieant Maior* shal shift his weapons: howe many pikes for the sleeues, and howe

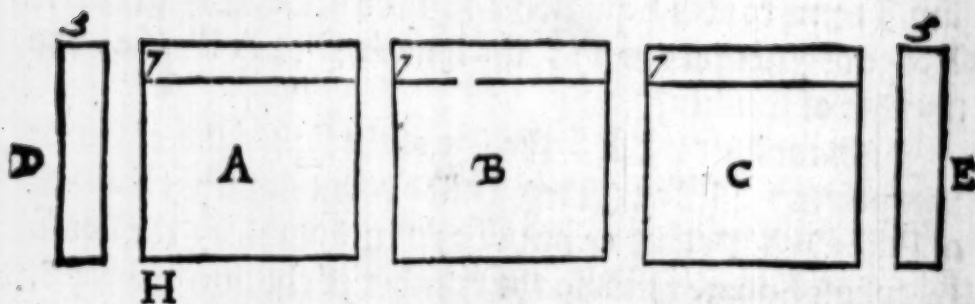
H.iiij.

many

many of short weapons and pikes in euery Battallion seuerally.

To resolve this Question, first I put the Marshalls order in Figure, A B C representing the 3 Battels armed in the fronte with 7 ranches of Pikes: D and E the Slecues 5 in a Ranke.

G



Now because I knowe not G H the side of the Battel or length of the sleues I suppose that  $1 \frac{1}{4}$ , the which increased by 5 maketh  $5 \frac{1}{4}$  for one sleue, that doubled maketh  $10 \frac{1}{2}$  for the 2 sleues, then Square  $1 \frac{1}{4}$  so haue I  $1 \frac{1}{4}$  the quantitie of one Battel, and so consequentely  $3 \frac{1}{4}$  for the 3 Battels. Which adioyned to  $10 \frac{1}{2}$  by 2 sleues maketh  $3 \frac{1}{4} + 10 \frac{1}{2}$  for Battels and sleues. But that should be 18000, for so many men were deliuered to make 3 Battels. Behold therefore the Equation  $3 \frac{1}{4} + 10 \frac{1}{2} \approx 18000$ , which reduced maketh  $1 \frac{1}{4} + \frac{10}{2} \approx 6000$  and so consequentely  $1 \frac{1}{4} \approx 6000 - \frac{10}{2}$ . The Value of this Roote by 4 fourth Rule is found to be 75 and certain fractions which alwayes in these *Militare Questions* may be omitted. I conclude therefore euery Battel must haue 75 in a Ranke, and that multiplied by 5 maketh 375 the number of Pikes in eyther sleue. And because the Battels are armed in the fronte with 7 Ranks of Pikes, I multiply 7 in 75, so haue I 525, the number of Pikes in euery Squadron, and that Deducted from 5625 the Square of 75, resteth 5100 the number of short weapon in euery Squadron. Thus standeth euery demaunde resolved as followeth.

Pikes

Pykes in eyther } 375. } Pykes in enery } 525. } Short weapon in }  
 Sleene. } Squadron. } enery Squadron } 5625.

The number of Rankes }  
 in enery Squadron. } 75.

### The thirde Question.

**T**Here is deliuered to the *Serieant Maior* 8500 *Souldiours* with commaundement that he embattel them in suche sort that euery *Souldiour* in front stande three foote distant from other, and euery Ranke from other 7 foote, obseruing this Ordinaunce he is commaunded to frame of these men the greatest Battayle that maye bee to make the grounde square. I demaunde howe many in a Ranke, and how many Rankes in that battayle.

For the number of Rankes I suppose 1  $\frac{1}{2}$  then must the number of *Souldiours* in a Ranke be  $\frac{7}{3}$   $\frac{1}{2}$  these multiplied together make  $\frac{7}{3}$   $\frac{1}{2}$  Equal to 8500 the whole nuber, whych Equation reduced standeth thus, 1  $\frac{1}{2}$   $\frac{36}{43}$   $\frac{1}{3}$  and so by the first Rule of Equations. I finde the Roote 60 with a Fraction whiche here neglected I affirme 60 Rankes in that Battayle, which multiplied by 7 and diuided by 3 maketh 140 the number of *Souldiours* in euery Ranke.

The number of } 60 The number of *Souldiours* } 140.  
 Rankes. } in enery Ranke.

**H**ow by this Art of *Algebra* or Rule of *Cosse* as the *Italians* terme it. The *Serieant Maior* or *Serieant General* may readily imbattel his *Souldiours* in what order soeuer it shal please the General or high Marshal to commaunde.

*Infinito*



*Infinite are the Formes of imbattelling some Circular as appeareth by Iulius Cæsar in his Commentaries when he declareth how his Armie Globo Facto, defended themselves, some Triangular, as in the same Commentaries maye be seene where his Souldiours being inuironed of their Enimies Cuneo facto erupere: Some ranged in forme of Lunula, wherein the Turke expect allie delyteth, reposing a certaine superstitious confidence in the Figure. But whosoever shal wel consider how impossible it is for any of these or like formes to Martch and maintayn their aray, as Souldiours in our age are trayned, shal be compelled to confesse the Squadron and Battels made and framed of Squadrons only in these our warres able to be used. And no doubt if the Turke Army martch and maintayne that forme, it must be by diuiding the same into many Squadrons, placing them in suche Lunular forme, & then euery of those Squadrons by the directiõ of discreet Colonels martching united, may maintayne their aray, & stil represent that their Lunular Figure. The like I suppose of the Romanes whose Legions were altogether componed of Square Cohorts. Seing therefore the best & surest, or rather the only kinds of Embattelling as wel to Martch as to Fight, is Square or componed of Squares, It shal be only needeful for the Sericant General to set downe in Figure the maner of embattelling by the General commaunded, as I haue in the former questions alreadye shewed, and then accordingly to proceed in his Operations, allowing for euery Squadron  $\text{I} \text{H}$  & for euery number of Souldiours answering to the side of a Battallion  $\text{I} \text{W}$  impalement or otherwise, only allowing  $\text{I} \text{H}$  so proceeding til he come to the Equation.*

*Finally, by the Art before taught searching out the Value or number of the  $\text{H}$  and  $\text{W}$ , he hath the number of Souldiours in euery Battallion, and the number of Souldiours in euery Ranke, together with the numbers of Souldiours and Rankes in euery impalemente, wings &c. as by the former questions and their operations maye evidently appeare. And by this Art the Sericaunte General shal be able suddainely, how great soeuer the multitude be, to change their forme of embattelling into as manye sundrye orders*

ders as he shal bee enioyned, or in respecte of the Enemy, or the place shal be founde conuenient.

*Certaine Questions touching the Office  
of the high Marshall and Campe  
Maister. Chap. 11.*

**A**lthough the forme of *Camps* may be altered according to the diuersitie of *Situations*, in respecte of *Riuers*, or woods that do adioyne therto, yet for lodging both *Horsemen* and *Footemen* commodiously readily and without confusio, there is none better than the *Square*. It behoueth therefore those Officers to vnderstand first what quantitie of ground sufficeth for the lodging and encamping of some certayne *Regiment* of *Horsemen* and *Footemen*, which knowen, by the *Rules* ensuing, he shal be able to extend the same to al numbers, and to knowe readily vpon the viewe of any ground what number it is able to receyue both of *Footemen* and *Horse*, and accordingly to giue order to inferiour *Officers* in what sorte they shall proceede to diuide their ground for euery *Regiment*.

*The firste Question.*

**A**dmit I finde by experience that 3000 footemen maye commodiously be encamped in a plat of ground 300 pace *Square*. I demaunde how many pace the ground shold be square that shall receyue 1000. Footemen.

To resolue this Question, I say the number of pace demanded is 1  $\frac{1}{4}$  the *Square* therof is 1  $\frac{1}{4}$  of paces, the whiche is able to receyue the 10000. then saye I thus by the Rule of Proportion 10000 giueth 1  $\frac{1}{4}$  of paces, what yeldeth 3000, by Multiplication and Diuision, I finde the  
A. fourth

fourth Proportional number  $\frac{1}{10}$   $\frac{1}{4}$  wherby it appereth, that in the Campe of 3000 there is  $\frac{1}{10}$   $\frac{1}{4}$  of paces, but in that Campe by supposition there is 90000 paces, so2 so much is 300 multiplied in it selfe; Beholde therefore your Equation.

$$\frac{1}{10} \frac{1}{4} \equiv 90000 \text{ Paces.}$$

The Value of the Roote founde by the firste Rule of Equations is betwene 549 an 550: so manye paces therefore oughte the grounde to be Square that shal receyue 10000, men.

### The Second Question.

I Finde by experience that 1000 *Horsemen* will demaunde as much grounde to encampe on as 10000 *Footemen*, I find also by experience that 550 pace Square of grounde wyll suffice to receyue eyther of them in one maine Squadron Campe, but my desire is to diuide eyther of them into 3 *Regiments*, and to lodge them seuerally in 3 square Campes. I demaunde how many pace Square euery of those Campes must bee.

For the number soughte I set downe 1  $\frac{1}{4}$  that Squared maketh 1  $\frac{1}{4}$  of paces, the Superficial content of one of the 3 Campes. Therefore shall the three Campes be 3  $\frac{1}{4}$  of paces, but those three were containd in 302500 paces, so2 so muche is the contente Superficiall of the Campe of 550 pace Square. Beholde therefore your Equation.

*The Equation.*

$$3 \frac{1}{4} \equiv 302500 \{ \text{which reduced makes} \} 1 \frac{1}{4} \equiv 100833 \frac{1}{4} \text{ paces.}$$

The value of the Prime searched as before is taught, is 317 pace, and so much Square ought euery one of the three Foote Campes and Horse Camps to bee, so2 the conuenient receite of such Regiments.

The



## The thirde Question.

**E**Xperience teacheth, that to encampe 6000 Footemen and 600 Horſe, in ſuch commodious maner that all the ſtreetes maye bee of reaſonable breadth, the Market place and place of aſſembly of ſufficient Capacitie, Rome ſufficient for the Munition, with a Ring and trenche meete to receyue the *Sentinels* and Souldiours for defence, together with the Carriages to impale the ſame Campe. To perſorme theſe dueties commodiouſly, it is requiſite the Camp ſhoulde be 32 ſcore pace Square. But there is deliuered by the Generall 30000 footemen, and 3000 Horſe: I demaund what ſcope of grounde the Lord high Marshall or Campe Maifter ſhould appoynt to receyue this company lodging them as commodiouſly as the other.

For the number of ſcore or paces in the ſide of this new Campe whole quantitie is deſired according to the Rule of Colle, I ſette downe  $1\frac{1}{4}$  and bycauſe the Horſemen and Footemen, in eyther Campe are proportionally ſorted, I adioun the numbers of Horſemen and Footemen together, which make 33000 and ſeeing the ſide of this new Campe is  $1\frac{1}{4}$  of paces, the Superſicial Capacitie muſt be  $1\frac{1}{4}$  of paces. I ſay therefore if 33000 Souldiours, require  $1\frac{1}{4}$  paces to encampe, what ſhal 6600 the number of Souldiours in the leſſe Campe: There ariſeth  $\frac{2}{3}$  paces, but by Suppoſition that little Campe containd 409600 paces, ſo manye are in 32 ſcore Square.

Beholde therefore the Equation.

## The Equation.

$$\begin{array}{l} \frac{2}{3} \frac{1}{4} \text{ } \text{ } 409600 \text{ paces} \left\{ \begin{array}{l} \text{This Reduced} \\ \text{maketh} \end{array} \right\} 1 \frac{1}{4} \text{ } \text{ } 2048000 \text{ paces} \\ \text{All} \qquad \qquad \qquad \text{And} \end{array}$$

And so the value of the *Prime* by *Extraction* of the Roote as is taught in the Chapter of *Equations* falleth out betwene 1431 and 1432 paces. So is the side of the newe Campe. 71 score 12 paces.

But if the Horsemen and Footemen had not bene Proportionally sorted to the numbers in your Little Campe: then is the readiest and surest way severally, by the Arte shewed in the first and second Question, to cast howe much ground epyther Horse Campe and Foote Campe wil require, allowing convenient groundplats for Market place, & places of assembly, with Streets to part the sayd Campes, and also space sufficient for the Ring of the Campe proportionally, according to the increase of the numbers of Souldiours to be encamped. Finally adding together the superficial contente of those Campes, places of assembly, and streets &c. There resulteth the superficial quantitie of the whole Campe, which reduced into paces, the Roote Quadrate thereof is the number of paces containd in the side of that Campe. And hereof I neede adioyne no Example, considering there is nothing else in this Operation but a reiteration of the former workings severally for epyther Campe, the places of assembly, the streets, &c. transferring by the Rule of Proportion the measures from one Campe proportionally to another.

### The fourth Question.

How the highe Marshal or Campe maister whatsoeuer number of Horsemen and Footemen shal be deliuered vnto him, may redily coniecture what quantitie of ground wil suffice strongly and commodiously to encampe them, and howe much he oughte to allowe to epyther Horse-campe or foote Campe severally.

To resolue this Question, it is cōuenient to know what quantitie of ground is to be allowed to a Horseman, and how much to a Footeman, and this is only by experience to be learned, and among the experimented Souldiours of diuers ages and Nations, I finde diuersitie of Opinions. Monsieur Lange alloweth to euery Footeman 90 Quadrate foote of earth, and to euery man of Armes 900, and to euery Estradiote and light Horseman 800. Others following the Romanes, assigne to euery Footeman a Quadrate platte of ground sixe foote broade, and tenne foote long, and to euery Horseman one with an other the lodging of three footemen. The Romanes sought alwayes to encampe strongly, pressing nigh together, not regarding pleasure or commoditie. But as their Proportion is somewhat too streight for Souldiorie trayned in this our age, whiche can neyther away with the anoyances, ne yet with the hard dyet, which was familiar to the Romanes: so iudge I the former Proportion of Monsieur Lange, ouermuche to dilate and enlarge the Camp, and therefore considering the strētes that diuide the Horse and foote Campe, must be large, and also betwēne euery Regiment in eyther Camp, there must be conuenient wayes and passages, neyther by ouermuche belating the Campe to make it weake, ne yet by ouer streightning of the Lodgings and passadges, to pester the Souldiorie, I hold it conuenient to allow to euery Footeman, 80 square foote of earth, and to euery Horseman 400, and for the places of Assemblie, the Market place, the Butcherie, the Victuallers, and place to receyue the Munition and Ordinance, with the Pioners, and other Mechanicall artificers as much more as both Campes amount vnto, so will there fall out after the Ring of the Campe is described of conueniente largenesse, and all strētes and passages in proportion answerable with due place to receyue the Colonels, Captaynes, and Officers of euery Bande particularly, that then the Lodgings of a Footeman shall not amount vnto aboue 50



foote, and euerie Horseman one with another 250. To resolve therefore this Question, you shall multiplie y<sup>e</sup> number of footemen by 80, for the superficiall content of the Foote-camp, and the number of Horsemen by 400 for the Horse-camp, the Products adde togyther, and double the resulting summe. The Roote Quadrate of this last produced number divided by 3, deliuereth in the Quotient howe manye Palse square the Campe shall be, whiche may both strongly and commodiously lodge your proposed Armie. And the Rootes Quadrate of the contentes superficiall of eyther Camp divided by 3, doth also deliuer howe many Palse the side of eyther Camp shall be.

### Example.

Admitte I haue 30000 Footemen, and 6000 Horse to be encamped, I multiplie 30000 by 80, ariseth 2400000. I augmente also 6000 by 400, ariseth likewise 2400000, these ioyned, make 4800000, whiche doubled, presenteth 9600000, the Quadrate Roote hereof is 3093, whiche parted by 3, bringeth in the Quotiente 1031. So manye palse shall the side of that Square Campe be, whiche shall lodge the thirtie thousande footemen, and sixe thousande Horse. If the Enimie be at hande, I would haue alwayes the Ring and Trench of the Campe within, but if the Enimie be not doubted, they may be made withoute this proportion of Camp, whereby the streets and lodgings may be enlarged.

The more ample handling of this office,  
referred to another Treatise.

I Mighte heere adioyne sundrye formes and orders of Encamping, vsed by sundrye Nations, and therevppon frame a greate number of *Arithmeticall Questions*, but I reserue the more ample handling of thys matter, to another

ther Treatise of *Fortification* of Townes and Campes, wherein I will declare howe by the *Topographicall Instrumente* described in my *Pantometria*, the high Marshall souldaynelie maye sette downe the *Ring* of the *Campe*, that shall receyue anye Arinie that shall by the *Generall* bee committed vnto hym, assigning to euerie Regimente hys *Quarter*, and howe wyth lyke celeritie the *Campe Mayster* or *Promotes* of euerie Regimente shall distribute theyr *Bandes*, and the *Harbinger* of euerie Bande hys seuerall Lodgings, so that the Armie shall speedily, strongly, and commodiousslie be lodged, withoute confusion or disorder. And for thys presente Treatise, beyng onely *Arithmetically*, these fewe Questions maye suffice to gyue some lyght to the *Ingenious Souldyours*, to searche farther how thys *Arte* maye stande hym in stead, for exact readie dispatch in hys *Militarie Actions*.

Certayne Questions Arithmetically,  
concerning the office of the Mayster  
of the Ordinance.

Chap. 12.

**I**F a Falcon of three ynches Bullet wey 500 Pounds, I demaunde howe muche a Cannon of eyght ynches wyll weygh, that is able to receyue hys proportionall charge to that Falcon.

This Question by the simple Rule of Proportion, cannot be answered, for as much as weight is peculiarly apperteyning neyther to lines nor Superficies, but onely vnto Solide bodies. Seing therefore as it is by Euclid demonstrated, and in my *Pantometria* I have already taught, that Spheres, and al other like and vniforme bodies, be in Triple the proportion of their Diameters, you shall multiplie either  
Diam.

Diameter or heyght of the Bullets Cubically, and wyth those Cubicall numbers, worke according to the rule of Proportion, as by the Example ensuing moze playnely shall appeare.

*Example.*

The Cube of 3 is 27, the Cube of 8 is 512. Nowe by the Rule of proportion, say 27 yeldeth 512, what giueth 500 the weight of the Falcon, the fourth Proportionall number amounteth vnto 9481. The Cannon therefore that shall bee able to carrie a Proportionall charge to the Falcon, must haue 9481 poundes of mettall, but bycause commonly those greater sort of pæces are not so masse of mettall as indeede they ought to be, the Gunners haue it for a generall rule, that in all pæces aboue six ynches of Bore, they must abate  $\frac{1}{4}$  of their ordinarie charges.

*The second Question.*

If a Falconet of three ynches the Bullet, require three pound of Powder for his charge, I demaunde howe mutche of lyke Powder will charge a Cannon of eyght ynches Bullet.

In this as in the former, the Rule of Proportion playnely is vsed sayleth, but working wyth the Numbers resulting by Cubicall Multiplication, the Quotiente will shewe the desired waight of Powder.

*Example.*

I multiplie 512 the Cube of 8 by 3 the charge of the Falcon, there ariseth 1536, whiche diuide by 27, the Cube of 3 the Diameter of the Falcons Bullet, so haue I in the Quotient  $56\frac{2}{3}$ : so many pounce of Powder is the due charge of your Canon, but if by the rule last taught, you find that the  
Canon



Canon hath not his proportionall masse of mettall, you may according to the vsuall Rule of Gunners, abate  $\frac{1}{4}$ , so will there remayne 42 poundes, and somewhat more of Powder for your Canons charge.

In this sorte by the Charge of any one peece of Ordinance knowen, you may find out the certayne Charge of all others.

*The third Question.*

If a Falcon that carrieth poynt blancke 150 pases, at vtmost randon randge 1300 pases, I demaunde howe farre a Culuering at his vtmost randon will reach, that at poynt blancke, or leuell, rangeth 250 pase.

I cannot here, but note the grosse error of Girolamo Ruscelli Nouarese, who in his Booke entituled *Militia Moderna*, intreating of greate Ordinance, supposeth, that in all sortes of Peeces, the difference of their vtmost Ranges, should bee in proportion answerable to the waight of the Bullets, and charges of Powder, and thereupon deliuereth a Rule by Multiplication and Diuision (the vtmost Randge of anye one peece knowen) to find the same in all other.

In the same Chapter also, he publisheth another Error, supposing that in one, and the selfesame peece of Ordinance discharged with severall charges or quantities of one kind of Powder, that the ranges of the Bullets should alway be Proportionall to the quantities of their charges, or waight of the Powder wherewith they are charged.

In both these cases, the diuersitie of the ranges is compounded of sundrie Proportions, as in a peculiar treatise for that purpose I will declare, and can not by the Rule of Proportion onely bee discovered. But in this Question, the Rule of Proportion precisely serueth, because the Poynt-blanke and Vtmost ranges in all Peeces whatsoever are

indeede Proportionall. I multiplie therefore 250, by 1300, there ariseth 325000, whiche diuided by 150, yeldeth for the fourth proportionall  $2166\frac{2}{3}$ , so many Paces shall the Culuerine reach at hys vtmost Randon.

And thus by obseruations vsed in one Piece, by this Arte of Proportion, a man maye discouer the force of all other.

Other matters in the Office of the  
Mayster of the Artillerie to bee considered.

I myghte heere adioyne many moe *Questions*, touching the weyght, quantitie, and number, of Powder, Shotte, and fundrie sortes of Ordinaunce to bee vsed at a *Batterie*: howe to mounte all sortes of Peeces, to strike anye marke at *Randon*: the number of Carriadges, of Ladles, Rammers, Scourers, Waddes, Tampions, Cartages, Matches, Barrells, or Lastes of Powder &c. Also, the number of Gunners, Assistantes, Pioners, Smythes, Carpenters, and other *Artificers*, to attende on the *Artillerie*, what numbers of Horses and Oxen to drawe them, the wayght of all sortes of Peeces, the charges of them, theyr Wheelles and Carriadges. Of those and many other thyngs to the office of the Mayster of the *Ordinance* apperteyning, as well for the *Fielde* and *Campe*, *Towne* or *Forte*, as also for seruice on the Seas, I myghte propone an infinite number of questions *Arithmetically*, but hauing in a peculiar Treatise of *Artillerie* prepared to handle at large all these, and many moe rare *Experiments* of greate Ordinance, I leaue farther in this place to wade in that Office.

**Questions**

Questions Arithmetically, concerning the  
Office of the Treasourer, the Mayster of  
the Victuals, and Captayne of  
the Pioners.

CHAP. 3.

*The first Question.*

If 17000 pounce be able to pay 5000 Souldyours for nine weekes, I demaund how much treasure will suffice to pay 30000 Souldyours for a yeare.

This Question as it standeth vpon a double consideration of men and time, so is it also to be double wrought by the rule of Proportion, saying thus, if 5000 Souldyours require 17000, what will 30000 for like time require. By Multiplication and Diuision I find the fourth Proportionall 102000 Poundes. Then agayne I say, if nine Weekes require 102000 Poundes, what shall 52 Weekes, for so manie Weekes are there in a yeare. The fourth Proportionall is 589333 Poundes and a Noble, so muche Treasure will pay 30000 Souldyours for a yeare.

*The second Question.*

If 1200 Quarter of Corne suffice 400 Souldyours for 9 Weekes, how muche ought to be provided to serue 25000 Souldyours for 40 Weekes.

Double working by the Golden Rule resolueth this Question even as the former. I saye therefore, if 4000 Souldyours require 1200 Quarters of Wheate, what shall 25000, working by the rule of three, I finde 7500 Quarters. Agayne I saye, nine Weekes demaunde 7500 Quarters, howe muche will 40 Weekes. The fourth

B. y.

Pro.



Proportionall resulting by Multiplication and Diuision, is  $33333\frac{1}{3}$ . I conclude therefore, that to mainteyne an Ar-  
mie of 25000 Souldyours 40 weekes. The Mayster of  
the Victuals must prouide  $33333\frac{1}{3}$  quarters of Wheate,  
in like sort may be forecast for all other Prouision.

*The third Question.*

If 500 Pioners can in tenne houres cast vp 400 rodde of  
trench, I demaund how many labourers will be able with a  
like trenche in three houres, to intrench a Campe of 2300  
rodde compasse.

This Question hath a farther difficultie than the other  
two last past, bycause in the seconde operation the Rule of  
Proportion must be inuersed, and wroughte backward, as  
by the Example shall moze playnely appeare.

*Example.*

First I say, if 400 rodde of Trench require 500 Souldy-  
ours, what shall 2300 rodde, here according to the plaine  
Rule of three, I multiplie the third by the second, so haue I  
1150000, which diuided by the first, deliuereth in the Quo-  
tient 2825 Souldyours: then must I say for the seconde ope-  
ration, if in tenne houres 2825 Souldyours bee able to  
discharge it, howe many shall perfourme the same in three  
houres. Nowe if you shoulde worke by the Rule of Pro-  
portion direct, you shoulde finde a lesse number of Souldy-  
ours, bycause three houres is lesse than tenne houres, but  
bycause reason teacheth me, that the lesser is the tyme  
wherein the Trench must be made, the moze Labourers I  
oughte to haue, I must inuerse the operation, multiplying  
to the first number by 2825 the seconde, and diuide by 3 the  
third number, so haue I in the Quotiente  $9416\frac{2}{3}$  so manie  
Pioners

Pioners muste I haue to Intrenche that Campe in three houres.

Hovve manye vvayes the Rule of Proportion direct, and inuerfed, serueth the tourne in these forenamed Offices.

*I*Thinke it not necessarie in these matters to propone any more Questions, seying the Ingenious Arithmetritien by consideration of these may deuise infinite others: As wel in the Treasurers Office to supputate the weekly, monthly, & yerely charge of euery Band of Horsemen or Footemen, how differente so euer their payes be, as also the charge of Ordinaunce, Pouder, Cariages, and al other sortes of Munition, and Instrumentes meete to follow any Army.

The Maister of the Pioners likewise, and Maister of the Vi-  
tuals shal neuer be able without this Arte to put readily in execution the commaundements of their superiour Magistrates: and the more perfection they haue in this Science, the more speedily & with lesse staggering shal they be able to discharge their duetie, & shal not neede to rely vpon the direction of any seruant or other hired person, as many do, that being appointed in Office wher they should direct others, are fayne first to hire some one or other to direct theselues. Or else that worse is, folowing their own unskilful brain, shame themselves and ruinate their Souldiours. To auoyde therefore such incōuenience. I would aduise euery Gentlemā that wil additt himself to the wars, to make this Arte first familiar vnto him, the which he shal finde not only in this Campe and felde seruices to enable him: But also in matters of Fortification it is so requisite, that it may by no meanes be spared. As in an especial Treatise that I haue begun of those matters I wil make apparant: And in this worke, being meere Arithmetical, may not wel be interlaced, the same crauing ayde also of Instruments and Demonstrations Geometrical.

K.ij.

Here:

**T**ouching the Art of Algebra howv much  
requisite for a Souldiour.



*His Art consisting of infinite varietie of Equations in numbers Cossical, and also of numbers Radicall, Rational and Irrational, woulde require a severall Treatise of great quantitie sufficiently to handle the same, but bycause the subtile Demonstrations of the moste curious Cossical Equations, and likewise the exquisite Operations in surde numbers, are rather for exercise of Inuention, & to shew perfection of Science, than for any necessitie to be used in matters Politike, or Mechanical, I haue here only briefly deliuered so much therof, as in a Souldiour may not be missed, Such a Souldiour I say, as shal in al Militare causes be able to see with his owne Eyes, heare with his own Eares, and discerne with his own Wits, and not resemble such as runne with others Legges, and flye with others Wings: such I meane, as if euery Birde should pul hir owne feather, like Esops Daw might daunce naked. These are no curious Inuentions, but plain, easie, requisite Rules that here I haue deliuered: The necessarie vse of the in my other Treatise of Artillerie, Archyitecture, Nautical, and Militare, shal more playnely appeare, meaning neuerthelesse, (God sparing Life & Libertie fro my long troubles) to satisfie also the expectation of such, as flye an higher Gate, and wil not sloop at common Pray: hauing in the latter part of my Pantometria, and in diuerse partes of my Book entituled Alæ seu Scalæ Mathematicæ, alredie deliuered sundrie Inuentions and Demonstrations, neuer yet disclosed by anye, which if please them in the meane time, they may peruse. And to such as delight in matter seruisable for the State in causes Militare (the same being indeede the Arte and Profesion onely or chiefly conuenient for the Nobility, and Gentlemen of this land) I hope this Introduction shal not be unwelcome: meaning as I see the same gratefully accepted, hereafter to impart the rest, leauing at this time farther to wade in the large Sea of Algebra & numbers Cossical.*

**A R D V A Q V A E P V L C H R A .**



Here follovveth the third Booke of Militare  
Stratagemes, Lavves & Dueties, according to  
the beste Discipline and obseruaunces of our  
moderne Warres, ascending from a priuate  
Souldiour to a Coronel, and from thence  
passing ouer most of the principal  
necessarie Offices of the field,  
ending vvith the Ge-  
nerall,





# The thirde Booke.

The conditions and qualities that  
ought to be in a priuate Souldior.

## CHAPTER. I.



As muche as the profession of a Souldior is of al other the most painfull, it is requisite that hee bee of a strong composition of body, to abide both heate & colde, hunger and thirst, trauel and watching, and that when he enter into this course of life, that he put on a resolutiō to abide al kind of hardnesse.

Item, that they bee chosen generally from 17. yeares of age till 45.

Also, that he be fitted wth weapon according to his strength. If he be a tall strong man, then is he fitte to vse a Pike: If little and nimble, let him practise to be a good Shot: The meane may vse the Halberde and Blacke Bill.

Item that he be of some occupation, not trayned vppe in ydlenesse: For of al other, the Ruffion that liueth ydely, and seeketh the warres onely in hope of spoile, is most vnfitte to make a Souldior, yea, by experience it is comonly scene, that they are the only cause of Mutinies, and one such is able to disorder and corrupte a whole Band.

That he be skilful in the weapon that he vseth, and haue also the qualitie of Swimming.

Item, that he exercise himselfe continually at ydle tymes among his companions in the Campe, in running, leaping, throwing the Barre, or such like, to make him aduise, and to auoide such idle pastimes as Souldiors comonly now adayes

L,

vse



use, contrary to all good order.

That he be in expences moderate, rather sparing than spending, and his expences to be rather in Armour and gallant furniture, than in excesse of meate or drinke.

That he keepe and preserve his Armour and weapon as one of his members, and that he be detested more than a Coward, that shal lose or play away any part therof, or refuse it for his ease and to auoide paines, such a one should not after be suffered any more to weare Armor, but either w<sup>th</sup> shame and punishment be dismissed, or made some abiect Prisoner.

For a Pikeman the Corset is the best kind of arming.

And the Harquebuzier with a light Brigandine, or doublet of plate, and a Purriā. The Halberdier may arme either with a sure Brigandine, or Corset. But aboue all other for a day of Battel the old Romane Shield, and the short sharp pointed Sword, which to execute in a throng of men excēdeth Halbert, blacke Bill, and all other.

He ought diligently to attende, and obediently to execute all such commaundements, as his Captaine or other officer of his Band shal enioyne him.

He must by continual and heedie practise endeuor himself perfitely to know the sounde of the Drumme, whiche being wel vsed, should be a very perfit guide of the Souldiours Martche.

Item, that in the fielde he haue alway a speciall regarde to his Ensigne, so that if he see the same in any danger to be surprized by y<sup>e</sup> Enemy, that he endeuor himself by al means withoute any respecte of daunger to preserve or recouer the same, for the losse of the Ensigne is not onely to the Ensigne-bearer, but also to the whole Bande a perpetuall shame.

The Souldior ought in his apparell & armour to fit himselfe, that hee bee apte and ready for any maner service that he shal be assigned to.

The priuate Souldiour ought not onely to be well able to  
use

use the weapon he serueth withall, but also sodainely to vnderstande all commaundements of his Gouvernors, whether it be by Voice, or sound of Drumme, or otherwise, and to knowe howe to maintaine himselfe in order withoute breacking array, not only marching, but also turning in Troupe or retyring, whiche Discipline is almost in these dayes lost. And that Souldior that knoweth his duety howe to behaue himselfe in the Camp, in Watche, Scoute, &c. And likewise in Marching, Turning, Retyring & Fighting to obserue the order by his Captaine prescribed, suche a one maye be called a trained priuate Souldiour, and if he be ignoraunt bereof, although he hath bene twenty years in the warres, I account him not worthy of the name of a Priuate Souldiour.

Finally, I woulde haue a Souldior so soone as he is dismissed, & out of pay, that forthwith he retourne to his Occupation or former calling, and not holde it anye imbasing of himselfe to retourne to an honest trade of life, considering in the most noble gouernement of the Romanes, who in Militare vertue surmounted all other, you shal finde howe from the Plough hath bin take a Dictator, who deposed Consuls, guided mightie Armies, ouer-ruled Kings, and yet thought it no disgrace to retourne againe to his priuate estate, benedicating nothing but the Fame and honour to himselfe, leauing and contemning the Spoile, and contēting himselfe with his owne poore possessions. Such noble Presidents ought Capitaines to lay befoze their Souldiors eyes, and to beate them from that corrupte opinion of Riches and Pleasure, which are the Enimies of Vertue, and the very original causes of the ruine of many stately Empires and Common weales.

*Tum Casa parua viros & frugi Mensa ferebat:  
At nunc Delicia & laqueata Pallaria, molles.  
Imbellesq; edunt Fætus, & lusuibus aptos.*

## The office of a Corporall. Chap. 2.

**T**he Corporal is a degree in dignitie aboue the private Souldiour, so ought he also in wit, discretion and diligence to surmount his Inferiours. There may be of these in euery bande more or fewer, at the discretion of the Captaine: but commonly nowe adayes there are assigned to euery twenty Souldiours one Corporall.

This Corporall oughte to keepe continually companie with his little Troupe committed to his charge, to lodge with them, and prouide for their want, and to instructe them howe to handle and vse the weapon they cary.

He ought to remember perfectly wel howe euery one is armed and furnished when he receiueth the in charge, and to see that no parte thereof be spoyled, but be preserved neate and trimme.

He ought to looke wel to the behauiour of his Company, not suffering them to vse vnlawful and prohibited gaming, neither to giue themselves to drinking and surfeting, but to spare of their pay to furnish themselves brauely and surely against the enemy, wherein he ought to vse his chief endeuor.

He oughte not in presence of his Captaine or other superiour Officer, to take vpon him more than as a private Souldiour, and diligently to attend to execute what they shal command, that his example may serue as a president to the rest.

But when this Corporall shall with his companie be brought to the place where he shal watche, he must prouide himselfe of wood and cole, to haue alwayes light in the body of his watche, and in such sorte to order his Scoutes, that hee may sodainly be able to aduertise his Captaine of any accident that shall arise, & that without disorder and tumulte of his company.

This Corporal also ought to deuise in some sort to Fortifie the place where the body of his Wach shal stand, in such sorte,



forte, that vppon the sodaine they haue not enforced vppon the coming of the Enemy to abandon the place.

Also immediately vppon the shutting of the Euening, he ought discretly and warily to order his Scoutes, and sundry times in the night to reuiew them continuing this diligence euen til the dawning of the daye, and therein to employe his Souldiours of greatest trust.

Also it shal be conueniēt, in place of great suspect, that he appoint double Scouts, matching an Harquebuzier with a Pikeman, that both they may the better be able to defende themselves being assaulted, & also by discharging of his Harquebuzer giue notice to the body of the Watch, that they may giue further aduertizement, and also put themselves in readinesse to abide any sodaine attempt: who ought not to abandon their place, but by the especiall licence and commaundement of the Captaine, or Serieant Maior, and then to retire themselves in order to the Troupe. And this maye beste be done if the Corporals be also interlaced, *Viz.* a Corporall of Shot matched with a Corporal of Pikes or short weapon.

The Corporall muste also see these watches maintained with Silence, to the end that they disquiet not the rest that should take their ease: and if it happen that any fault be committed, his part is not violently to punish the Souldiours himselfe, but to make it known to his Captaine who muste not neither, as some rashly do, reuenge it himselfe, but communicate the same with the Marshall or his Prouost, who onely haue vnder the General authoritie to punish. And this due course of Iustice shal be more terrible to the Souldiour, and breede lesse ill will in them to the Captaine & Officers.

Some vse vnder euery Corporall two Disniers, whyche the Romanes called *Decanos*, & *Decuriones*, euery of the had the charge of 9. souldiours, himselfe making the tenth, suche a company of the Romanes was called *Contubernium* or *Manipulus*, the which order is now reuiued among the Spaniards,

whereby their souldiors are kepte in verye good order, and their furniture very well and neatly preserued.

### The duty of a Serieante of a Band.

Chap. 3.

**T**his Officer ought to be a man chosen of quicke spirite, and actiue body, able both sodainly to receiue and painfully to execute : and to the ende he be not staggering and astonied vpon new accidents, but prompt & ready vpon euery sodayn to do that to him appertaineth, I would wish that he should passe both the former grades befoze he be admitted to this.

This Serieant ought perfittly by memozie to know euery Souldior within the Bande, and howe he is armed, who bee Halberdiers, who Pike-men, who Harquebuziers, who Bill-men, &c. whiche are well armed, and whiche not, that hee may vpon euery sodain, place them accordingly, arming the vtmost ranckes with the surest men and best furnished.

He ought (when occasion is) to sort his men, euery kinde of weapon by himself, and to dispose them in a certain number by Rancke, as 4, 5, 6, or 7, in a Rancke, accordingly as he shall by his Capitaine or Serieant Maior be commaunded, teaching them to march forward and backward, and also to turne without disorder.

He ought to assigne to eche Souldiour his due place, not suffering them to contend or fall out among themselves for the foremost or better place, but therein to vse this indifferencie, that the best Armed be placed in those places of force, whereby not onely in time of pꝛoue they are more in securitie, and the Bande that way the more gallant in shewe: But also the Souldior (to gaine the place of more accompte) wil spare of his pay to arme himselfe the more brauely.

The Serieant also ought, if Victuall want, or Powder, or Shot, or Match, or any other necessary, immediatly to make it knowne to his Capitaine or other Officer for that cause appointe



appointed, and to get it for them as good cheape as he can, & afterward to distribute the same among the Corporalles, giuing order that it be by them iustly and equally distributed among the Souldiors.

To this Officer it appertaineth aswell in receiuing as in laying out to prouide all things for the Company, saue only Lodging, for that appertayneth to the Harbinger. And therefore me thinketh it were requisite that this Officer should be able to Write, for it is harde by Memorie alone to discharge so many things wel as he shal be charged withall.

He ought alway to accompany the Watche to the place where they shal stand, and then to giue order to the Corporalles, that they vse greate diligence in sending and setting their Scouts, and finally, at his departure to giue them the Watchworde, whyche hee shal receyue from the Sericant Maior, or Marshall.

He ought with great diligence to attende that the Sericante Maior or his Captaine shal commaunde him, and to see it speedily executed, rebuking and teaching suche as doe amisse, shewing their faultes: but in no wise to strike or beate a Souldior, for thereby he makes himself worthy of that punishment the Souldior otherwise for his fault should haue.

He ought himselfe to be thoroughly wel Armed & appointed, aswel to defend as offend, and after he perceiue things wel in order, then ought he to clap himselfe in Array wth them, but in such place as he may sodainly steppe forth and remedy any new disorder, and to returne to his place again, for the diligent & skilfull vsage of this Officer is of no small momēt to mainteine good order throughout y<sup>e</sup> whole Band.

This Officer among the *Romanes* I cannot finde, neyther in these dayes (if other partes of *Romane Ordinaunces* were renewed) should we neede them, but til a perfite reformation of all disorders these also may be tollerated.

The



The office and duty of the Ensigne  
of a Bande. Chap. 4.

**A**s it is conuenient for every Souldiour to stand vpon his credite and reputation, accompting no losse of goodes comparable to a dishonorable soile: so ought especiallpe this Officer to whom the charge of the Ensigne is committed, aboue al other to haue honozable respect of his charge, and to be no lesse careful and iealous therof, than every honest and honozable Gentleman should of his wife.

Also I like wel some Ceremony should be vsed in deliuerie of the Ensigne, and that he receiue it by Othe in presence of the Band, & that every priuate Souldiour should be sworn also to the Ensigne, as amōg the Romanes it was vsed, when he was not accounted a Souldiour, but a Thiefe or Robber, till he hadde taken his othe, and therefore was their warre called *Militia sacrata*.

Also he ought to haue with him two or thre Assistants of the mosse honest and valiantest Souldiours of the Bande, to whom vpon any inst and vrgent occasion he might commit for a time the charge of the Ensigne.

He shoulde marche aduisedly and couragiously, without affectation or vaine brauery, not bowing his body, or uncovering his heade to any, but to the Generall, Coronell, Captaines or other his betters do reuerence, onely by abbasing and enclining the toppe of his Ensigne, more or lesse as the partie is in degre his superiour.

He ought to know that the Ensigne in set Battels ought neuer to change from the middle of his Band, but in marching twise, in Scaling of a Foote, or assaulting a Breache, the Ensigne should endeuor himselfe to be the first and foremost.

He oughte so to behaue himselfe, that hee bee beloued of all the Souldoures, considering thereby not onely his

his owne person shall be in moze safette when he attempteth perillous exploytes, but also the whole service moze bzauely and honourably exployted, for the value and vertue of the Ensigne setteth forth the vertue and valoure of the Captayne and whole Band.

He oughte alway to haue attending on him a Drumme or two, to gather his Souldiers together when neede is, and for other necessarie respects.

I thinke good that he be allowed his Horse with hym in marching, but his baggage to be caried among the rest, with the ordinarie cariage of the Band.

Let the Ensigne be a man of good accompte, honest and vertuous, that the Captayne maye repose affiance in, and not as some Captaynes fondlye doe committe the same to some of their inferiour seruants.

The Ensignebearer ought to be well apparelled, and to giue the moze reputation to the office, let him alway haue a Gard to attende vpon the Ensigne, as well in place of suspicion, as otherwise, and those to bee altered at the Captaynes discretion.

He shoulde be continually Armed, as well when no perill is feared, as in time of danger, to giue example to the rest of the Souldiers not to thinke their Armour burthensome, but by vse to make it as familar to him, as hys Skinne.

The Ensigne should bee so marked, that both farre and nere the Band may know it from any other in the fildes.

The Ensignebearer ought when the warre is ended, to deliuer vp to his Captayne agayne hys Ensigne, and although he haue eyther in Battayle or Assault so valiantly vsed himselfe, that he haue in deede deserued the same as an honourable remembrance of his valure, yet shoulde he rather accept it by the assignement of his Captayne, than to seeme to vendicate it as due.

¶

This



This Office was also among the *Romanes*, and was called *Signifer*, or *Bandophorus*, a Person nexte their Captaynes, of greatest reputation.

### The Lieutenant of a Bande, his Office. Chap. 5.

**T**he Lieutenants Office as it is of credite and reputati-  
on, so is it also an office of greate toyle and payne, the  
whiche he oughte willingly to suffer, as well to discharge  
hys Captayne of toyle, as for hys owne reputation.

He ought not to vendicate to himselfe, any Authoritie,  
but thoroughly to vnderstande and repozte to his Captayne  
the state of things, and from him to take his commission  
and direction.

He ought frankly and faithfully to giue his Captayne  
his aduise, as oft as it shall be demaunded, but not to pre-  
sume to aduize his Captayne vndemaunded, vnlesse it be in  
case of present perill.

He shoulde in all factions or questions among the Soul-  
dioures, be altogpyther neutrall, and louinglye to worke  
wyth them for Pacification, and if he can not by curtesie  
frame them, let hym communicate the matter wyth hys  
Captayne, and then saythfully execute hys Captaynes di-  
rection.

He ought neuer during the time of seruice to haue Que-  
stion with any, nor suffer any other to committe the lyke  
disorder, for that in euerie Band ought senerely to be prou-  
ded for.

It perteyneth to him to ouersée the Sericants, and Corpo-  
rals, that they doe their duetie, and oftentimes with his  
owne person to ayde them in setting the Watch. &c.

He ought many times to reuiew y<sup>e</sup> bodies of the Watch,  
to see how they execute their duties, keeping them Vigilant  
and diligent to their charge.

He



He ought brotherlie and friendly to vse the Ensigne, advising him with his aduice, and to be a friendly Mediator to the Captaine for the inferiour Officers and Souldiours, for their pay, or any other wante.

He ought both to see the other inferiour officers to their duetie, and also that they be obeyed without contradiction, and that euery Squadron bodie of the watch haue their Armour, Weapon, &c. sorted and in readinesse.

I hold it also conuenient, that these little Bodies of Guard or watch be not of countrey men or neyghbours; but mixte one with another, to auoyde factions, & other incōuenience.

In absence of the Captaine, he ought to be obeyed and honoured as the Chiefe, but in presence of the Captaine not to take vpon him any such authoritie.

He should be able to speake well and sensibly, to expresse his mind, that the Souldiours might vnderstand him, how and what they haue to do.

He may haue his Horse, because he hath occasion more than other to be stirring about the Band, to see and prouide for all disorders.

His baggage and Prouision should (enen as of euerie other Souldiour) be as little as possiblye he maye, and the same to be caried among the ordinarie prouision, with the rest of the prouision of their band.

This Officer I find not in the *Romane* Armies, neither see I any cause why in these Dayes we shoulde neede them, if the Ensigne and other officers sufficiently knewe their duetie.

## The Office and duetie of a Captaine.

### Chapter.6.

A Captayne ought to consider if he hath the charge of his liues of men committed to his hands, and if any quaille vnder his conduct, either by rashnes, or want of knowledge, he is

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to rene

to render account thereof befoze the great Iudge. Considering therefore his important charge, he oughte, befoze hee take the same vpon him, to passe some of these former degrees, and that in place of seruice, wherby he may finde his owne sufficiencie or insufficiencie to discharge a place of such importance.

He ought first to make choyse of sufficient, expert, honest paynesful Officers. A skilfull Lieutenant, a diligent Sericant, vigilant Corporals, a godly Priest, a trustie Clarke or Register, a prouident Harbinger, a cunning Surgeon, with necessarie prouision, and two or thre good Drummes.

And after he hath brought all his companye together, hee shall solemnely deliuer the Ensigne to a chosen man for courage and honestie, causing him in pzesence of all the companie to take his oth. &c.

He shall also make choyse of two or thre of the expertest Gentlemen of his band, that are well able to discharge any of the inferiour Offices, these maye be named his Lieutenants extraordinarie, and these he is alwayes to haue about hym vpon any suddayne, to execute his commaundements, and ayde his other officers when time shall serue.

The Captaine ought perfitely to know what apperteyneth to the office of euery of the forenamed inferioure officers, that he may pzesently redresse any thing amisse, and giue them instructions and order vpon euery new accident, eyther in Marching, Encamping, or Fighting, what they haue to do.

He ought alwayes to be in the pzesence of the Coronell or Generall, to be enformed of querie particularitie that is determined, that he may be the better able vpon any occasion to employe such seruice as is commaunded, to the honor of his Coronell, and reputation of himselfe and his Souldiours.

He ought to take order for the carriage of y<sup>e</sup> baggage of his souldiers, & to see that they haue as little Superfluitie as  
may



may be possibly, to send they may both more speedily march, and also vpon any seruice, be rather forward to take from the enemye, than haling backward for feare to lose theyr owne.

He ought not to be couetous or niggardly: neuer to keep backe his souldiours paye, but by all meanes to seeke to get them their pay, and to his abilitie rewarding them ouer and aboue, for by that meanes he gayneth honor, and maketh them assured to him in any perillous seruice.

He ought not to suffer any souldiour saue onely his principall Officers to haue any horse: In his officers it is tolerable, because they may sometime serue for Light horsemen to discover &c.

He ought to haue knowledge in Fortification, especially in the maner of making Trenches and Rampiers, for as wel in defending, as assaulting, they are often vsed.

He ought neuer to be disfurnished of Lanternes & torches for the night, suche as in anye storme or tempest wil burne, for many times they maye stande hym in singular steade.

He should alwayes lodge himselfe among his companye, & to endeavour himselfe to tollerate paines and hardnesse, for it is no small comfourt to the Souldiour to see his Captayne take such part as he doth, and contrariwise taking his ease, and suffering them to be lodged or fed miserablye, breedeth him hatred or contempt.

He ought euerye night that Watche is kepte, to sende his Serieant to the Serieant general, or other Officer that deliuereth the Watch worde, and the same to keepe very secretelye and vse it warily, for negligence therein sometime breedeth many mischieses.

He oughte to be wel practised in all these particularities, for a good witte without Practise will be to seeke in these matters, and if he be not also Valiaunt vpon Sundayes, he shall neuer be able to execute his duetie.

He should be eloquent, and able compendiously and plainly



ly to vtter his minde, and also to perswade and diswade, to recreate and sometimes to prouoke and stirre by mennes mindes, which oftentimes in these painefull perillous Actions languish, and haue neede of quickning.

He ought not to beate his souldiour, but deliuer him to the Marshal or his Prouost, to haue him punished, for in beating of him, he maketh himselfe hated, and embaceth himselfe, and maketh his Souldiour eyther Mutinouse or abiect.

He ought continually to kepe his Souldiers occupied in Actions Militaire, making them sometime shote for wagers with the Harquebuzze, sometime to wrestle, to runne and to leape in their armour, to march in aray, to cast themselves in a Ring, to retyze in order, and Marching, sodainely to stande, and such like, whercof the Captaine maye deuise infinite varietie, both to delight and also to make his Souldiours perfite, and so farre better spende their time, than in tole lewde pastimes.

He ought not to doe anye thing with his Souldiours, but to haue his Ensigne and his Drumme with him, as well to giue the more reputation vnto the Action, as also that the vse of them may be well knowne, and vnderstande of all the Souldiours.

Finally, a Captaine ought so to behaue himself, as he bee both loued and obeyed of his Souldiours, and that they as wel knowe how to obey, as he to commaund, and that he endeavour himself by al means to annoy the Enemy, and painfully to execute, with all diligence, such matter as he is employed by his Superiours, and to feare nothing but Infamie.

Of Captaines there were two sortes among the *Romaines*, the one was *Centurio*, who had charge of .100. mē, the other was called *Comes* or *Cohortis Praefectus*, & had the charge of one *Battailiounne*, vnder whom ther were diuerse *Centuriones*, but one only *Ensigne*, for euery *Centurion* had not his *Ensigne*, as in these our disordered warres is accustomed.

The

## The Office and duerie of a Coronel.

Chap. 27.

**T**He Coronel so soone as he is elected by his Prince or General and hath receyued his Patent and money for the leauping of such a number of men as are to his charge appertayning, ought immediately to make good choyce of his Captaines, assigning such number of men to euery one of them as he seeth cause, according to the experience and ability of the persons.

The more Captaines and Officers that he maketh, if they be able men, the more readlye & the better also shal he take order for the good execution of any seruice, but by such multitude of Officers the Prince shall be ouer much burdened with excessive paye, the Wisdome therfore of the Coronel must be in this, that he so distribute & diuide his company, as neyther a conueniente number of Officers be wanting, nor yet the Prince ouercharged.

He ought immediatly after he hath elected his Captains, to deliuer them Imprest mony, to euery one seuerally, suche a portion as may suffice, the whiche he ought to cast before hande, that he maye from his Generall receyue allowance accordinglye : for it is requisite that in the beginning men be not discouraged for want of necessarie prouision, but in suche sort prouided for, that the souldiours may growe into a liking of their Capitaynes. And if the Coronel sometime of his owne, lende to his Captaines, he shall greatlye binde them, and that without any Detriment, considering he is sure to be answered the same againe vpon their pay.

He ought also to make him a Lieutenaunte, who besides his own peculiar Band, ought to take like care of al the Regiment that hath bin alreadye declared of a Lieutenaunt in a private Bande.

He oughte in like manner to create hym a Sericaunte,  
such

such a one, as hath bene not onely of good experience in seruice, but also in this kinde of seruice, for to him it appertayneth sodainely to put men in aray, to alter and change them as the place or occasion shall require, besides manye other partes that hereafter moze plainly I will entreate of in the duetie of the Serieaunt Maior.

He ought also to appoint his chief Harbinger, who ought diligently and indifferently, to assigne fit lodgings to euery Band, and then the Harbingers of euery Band, are to distribute the Quarter appointed, among the Officers and Souldiours of the Band.

In like manner he oughte to make good election of hys owne Ensigne bearer, who shoulde be in value and reputation, a man aboue the rest of that calling.

He shoulde likewise make a chiefe Drumme that shoulde take charge of the reste, instructing them in all particularities that they may both agree and readily execute any orders by the Coronel commaunded.

He ought to see that hee want not of Collets, Purianes, Brigandines, Halberdes, Blacke bills, Pikes, Harquebuzes, Lead, Match, Powder, and Victualles that maye suffice for his Regiment, and for al these things that his souldiours be not cracted on in the price.

And aboue al other things, let a Coronel take heede that he be not noted to be a piller of his souldiours, or to play the Marchaunt, making his gaine vpon them, in selling them furniture vpon excessive prices, for there is nothing so repugnant to the honorable profession of a Coronel, as to be noted Miserable and an Extortor vpon his Souldiours.

He oughte also to examine the choyce that his Capitaines hathe made of their Officers, and if they be good to allowe them, or else not.

If his Regiment amount to the number of a five or six thousande, then shal he not neede other horse than those that are allowed to the Officers of the Bandes, who may serue the



the fourne for discouerte &c. But if his Regiment be smal, I woulde wishe he had an hundred horse at the leasse, whiche should be Harquebuziers, for winning a passage fro Pefants & vnarmed mē, or fetching in a Booty, they ar singular good.

He should haue about his person certain wise expert valiant Gentlemen, that be able vpon any suddaine, to execute any of the inferiour offices, and that are able both quickely to conceue, and playnely and sensibly to vtter any newe accident, or thing whatsoeuer that he shal see. And these oughte he to haue continually about his person, to execute such matter speedily and faithfullye, as he shoulde commaunde them. These maye be named his Lieutenantes extraordinarie.

It is also the part of the Coronel to assigne euery Captaine, what kinde of weapons his souldiours shall vse, and albeit the present custome be, that euery Captaine shoulde haue in his Bande both Pikers, short weapon, & shot, yet do I holde it farre better, that they shoulde haue in their Bande but one sort of weapon. For by that meanes in euery seruice the Captaine should alwaye accompany his own Souldiers, whereas otherwise if he wil abyde in the standing battayle with his Pikers, he must committe his shot to be ledde by an other, and his short weapon by a third, which is an extream disorder: and nothing so much encourageth the Souldiour, as to see his Captaine a companion of his perils, and the contrary no lesse dismayeth him.

Finallye he oughte alwayes to attende in the presence of the General, to honoꝝ and obey him, and to refuse no paynes in exploiting his commaunded seruices, for those paines are honoꝝable, they get the Fame and make the immortal.

This Officer was also in vse among the *Romaines*, & was then called *Drungarius*, *Tribunus Militum*, and *Chiliarchus*, & commonly in euery front or face of ther battayles they had two or three of these *Tribunes* or *Collonels*, and the gouernor of the whole front was named *Turmarcha*, *Merarca* or *Tur-*

*marum Praefectus*, comparable in some respectes to the *Captaynes* of the *Vaward Battayle* and *Reerewarde*, sometimes in these dayes vsed.

### The office of the Scoute maister.

Chap.8.

**T**His Officer in the auncient Romaine wars was neuer in vse, for they would neuer admit any Watch without the trenches of their Campe, but obserued this order, that euery night one third parte of the Arme remayned armed, the other two thirdes toke their rest. And this armed parte they diuided into foure quarters, and appointed to euery Watch of the night one quarter, whiche wente and walked continually about the trenches of the Campe, to heare and see if they coulde discerne anye noyse or stirring nigh the Campe, the other three quarters resting in the meane tyme armed in the place of assembly. And when the firste Watche of the night was ended, then departed another quarter to the reliefe of the Watch, and the quarter that had watched, returned to the place of assembly. And thus they continued relieuing the Watches till daye. So that the enemy coulde neuer approche their Campe, but they founde one third part in Armes, who were able to keepe them play, till the rest had put themselves in order. But after the Militare discipline grewe to corruption, and that Souldiours neglecting honor and securitie woulde no longer abide the hardnesse and seueritie of the Antique Discipline, they inuented this kind of Forraine scout, that the paynes of a few might leaue the rest at ease. But what mischiefe hath and may thereby ensue, Histories will shewe vs, and common reason maye some teach vs. But seeing among manye other corrupt customs of these our times, this is now also in all our Christians warres vsed, I wil briefly shew his office, as among vs it is now a dayes accustomed.

The



The Scout maister oughte diligentlpe to vblewe and note rounds about the Campe, al the places of suspecte where Enimies in the night time might appoach, that he may accordingly afterward dispose of his Scoutes, and therefore hee shoulde attende vpon the high Marshal at suche time as hee goeth to make choyce of a meete plat to encampe on. And then to speake his sanctie, touching the conuenience or inconuenience of the seate, in respecte of due place for the Scoutes.

Also as soone as the Trumpet soundeth to the Watch at night, he must immediately repaire to the Licutenaunt of the Horsemen, requesting him to assigne him a competente number of Horsemen, to attend vpon the Scout that night, and then must he giue them charge vpon pain of death that none of them abandon thei places, till the Discouersers be come into the fielde, and haue taken thei places.

The best order for the placing of the Watche, that I haue noted, is thys. Firste he shall set the ring Watche rounde aboute the impalement of the Campe, *vid.* a Bill, a Bowe or Harquebuzze, and a Pike, and euery one a Pike length from another: then without them, certain little Troupes, five or six in a troupe, of footmen of different weapon, *vid.* Bowes, Harquebuziers, Pikemenne and Short weapon, and these Troupes alwaye to send forth a couple, whereof a Harquebuzier alwayes to be one, and these to pry and hearken what they can discerne. Again without this Foote Scout, other small Troupes of Horsemen, five or six in a companye, and these likewise to disperse themselves abroad to discover what they can. And if they happen to see or heare any thing, presently to repoynte the same to the Foote Scout, & one or two of the Foote scouts, to repaire to the Scout-master, who is (if it bee matter of importaunce) to open the same presently to the high Marshal.

Besides all this, in tyme of suspecte it were requisite  
P. 4.



that a Stande watch be maintayned within and aboute the Ordināce. But bycause that appertaineth not to the charge of the Scout Maister, I let it passe.

It is requisite in the long colde winter nights, to relieue the Wacch five or sixe times at the least in a night, the same more or lesse as y<sup>e</sup> Scout maister, & other p<sup>r</sup>incipal Officers shall thinke meete, for the better p<sup>r</sup>eseruation of the people.

Also in the morning so soone as the Trumpet soundeth y<sup>e</sup> reliefe of the Watch, he must repayze to the sayde Licutenantes tent, there to receyue by his assignement, a conuenient number of Horsemen to scoure that daye, and then shall he giue order vnto some, to ride to the highest hills to vie we rounde about what they can espie, and others to the valeys and other obscure passages, woods, or such like, and to ride one from another a good distance: so as if one chāce to be surprisid by y<sup>e</sup> enemy, yet the rest maye escape & bring intelligence therof, & so soone as y<sup>e</sup> Scout maister shal receyue any aduertisemēt by the scouters, he shal forthwith repayze to the high Marshal, & enforme him of euery particularitie.

He ought in placing of his night Watches or Sentinels, to vse great consideratiō, first in setting his little Troupes, or bodie of the watch in some places of strength, so as they may be able, when the enemie shal approch, to make resistance and defende themselves, till such time as the Campe maye put themselves in armes. And besides these troupes, he shal giue order y<sup>e</sup> two or three shal walke for the one waye, & as many moe another, & if they happen to see any matches light, or heare any noyse, forthwith one to repayze to the body of the Watch, & so to the Scout maister, & the other to stay til they can more plainely perceiue what the matter is. And it shal be alwayes good to match some Harquebuzes together with Pikemē, as wel that they may be the better able to defend themselves, as also by discharge of their Harquebuz, to giue warning to the rest, if any one of them should happen to be surprisid by the Enemy.

This

This Officer ought to be both diligente and paynefull, considering howe greate a charge dependeth vppon these Scouts, no lesse than the preseruaton or destruction of the whole Camp, and therefore he ought continually both day and night, eyther himselſe in person, or by some other of greate trust in his absence, from time to time to peruse and examine the order and demeanour of these scouts and scouers, giuing order for reformation of all that he shall finde amisse, and so soone as he shall receyue anye intelligence, forthwith to aduertise the Lord high Marshall.

The *Romanes* had their Discouersers called *Scultatores*, or *Speculatores*, and others, called *Campiductores*, whiche were the guides or Conductours of their armie, by the most conuenient wayes and passages : but of any such peculiar officer permanente, I haue not red in the *Romane* Stories.

## The Office of the Serieant Maior.

### Chapter. 9.

**T**His Officer is also of reputation, and ought to be a man of great courage, and well experiēced, that he be not dismayde with the Terror of the enimies presence : for the most parte of all his actions are to be exployted euen in the face of the Enimie.

He ought to be a man of liuely spirit and quicke Inuention, that he may suddaynely perceiue, and quickly conceiue the nature of the Scituation and order of the enimies array, altering and disposing accordingly of his owne.

He ought euerie day to repaire to the Lorde High Marshall, or the Lieutenant Generall, to receyue direction in what sort their pleasure is the Armie that day shal march.

He ought to receyue from the Lorde High Marshall a perſite Rolle of all the Bandes, and in euerie bande what number of short weapen, what Pykes, and what Shot, and the same to haue alway aboute him, that if anye wante, he

may admonish the Muster Mayster and Treasourer thereof, epyther they may be supplied, or hys Roule resourmed.

The Sericant Maior after he hath from the Marshall, or Lorde Lieutenant Generall receyued instruction in what sort the Battayle shall march, he must presently sort euerie kinde of weapon by it selfe, and then draw them forth in Hearses or Blæues, 5. 6. or 8. in a rancke, as the prescribed order shall require.

He ought so to place euerie band, y<sup>e</sup> their Captayne may be with them, to directe and animate them: but this is impossible to be done in these our warres, where euerie small Band is diuided into seuerall weapons, so that the Captains in time of seruice can not accompany his owne Band, contrarie to all good order and Discipline.

He ought when a daye of seruice commeth, to goe wyth the High Marshall to view the place where the Battayle shall be foughte, and there to speake his opinion howe the matter should be ordered, and y<sup>e</sup> done, obediently to execute suche directions as he shall receyue from his Superiours.

To this Officer it apperteyneth, so to sort his Souldyours, that the best armed impale the rest, and that the face and flankes of your Battayles be well armed with Pykes, the Ensignes well garded with Halberdes, the tayle enclosed with the Carriadges, Wings of Shotte on epyther side, and those Wings more or lesse accordingly as the place is larger or streighter, stronger or weaker, on the one side, or on the other. These Wings represent the flankers in Fortification, and ought as orderly to flank and skoure before the face of the Battayle, as Bulwarkes dothe the Curtane of a Towne or Forte.

He must also so order the Forlorne hope in y<sup>e</sup> front of hys Battayle with new supplies out of the Wings, or from betwene the Battayles, that the Front of the armed men be neuer left naked or vncouered, till both Battayles come so nigh, as they be readie to ioyne and crosse their Pikes, then  
may



may the Shotte retire eyther to the Wings, and so to the Ordinance, or betwene the Battayles to the Carriages.

If the Souldiours be rawe and vntrayned men, it maye be tollerated to put them into one mayne Square well impaled with Pikes, and so commit it to one bunt. But if the Souldiers be trained in such sort, that they can in fight both march forward if they preuaile, or retire vpon advantage, and yet mainteyne perfiteley their Arayes, then by no meanes committe the Battayle to one hazarde of Fortune, but after the old Romane manner make thre or four several Fronts, with conuenient spaces for the first to retire and unite himselfe with the second, and both these if occasion so require, with the third. The Shot hauing their conuenient lanes continually during the fight to discharge their peces, which shall make an incredible spoyle of the Enimie.

It is also the parte of this Officer, in time of rest, when the Enimie is absent, to cause the Bands to assemble, and to put them in sundrie sortes of standing and marching Battels, to reduce them sometime into smal Squadrons, of 400 or 900 in a battayle, more or lesse at his pleasure, & to cause these Battallions to march forward swiftly or slowly according to the stroke of the Drumme, to stay and to retire in perfite measure, no lesse assuredly, than men are taughte to daunce by the sound of Muscicall instruments. And whē they can perfectly doe this, then cause them suddaynely to make any Flanke a Front, or turne entirely together, as if it wer one bodie, without breaking their Aray. And when they cā do this, albeit they neuer sawe any enimie in the face, yet may they be tearmed Trained Souldiers, & if they wat this skill, albeit they haue bin in twentie battels, and twenty yeares in the wars, I hold the raw souldyers, & vntrayned Bands.

It is also a poynt of great cunning to make a Squadron march vpon one corner, maynteyning still his Square fourme: and this and such like varieties in marching, albeit they be not in service so necessarie, yet doe they bring  
the

the Shouldyours to a singular readinesse, and are farre better, and moze commendable pastimes, than Dicing and Carding, whiche the famous Romanes in their Campes would neuer tollerate.

He must consider the difference betwene marching and standing battels. And this is a generall rule, that there is no Battayle meete to march, but only the Battayle that is square, or compound of Squares. All others, as the Lunula, the Triangle, the Pentagonall, and Hexagonall Battalles, the Circular, and Ouall, with infinite others that easilie may be inuented, neuer serue to anye vse, but onely in fixed and immouable Battailles, for presently in marching they disorder.

These kinde of immoueable Battayles though of themselves they are smally seruiceable, considering in all encounters continuall motion is required, and it is not possible to trayne men to that perfection, as being ranged in such forme of battayle, shall not presently in marching breake their aray. Yet for exercise of men, I holde it verie requisite, that the Sericant Maior both know how, & also often do put his Shouldiours into these fashions of embattayling, causing the suddaynely to change from Triangle to Square, from Circulare to Lunulare, and thereby bying them to suche perfection in these vnnecessarie hard cunning toyes, that the other playne seruiceable fourmes may seeme most playne and easie.

This Officer ought before hand, to premeditate and cast in what sorte with most facilitie he may bying his men to order of battayle, committing to the peruliar Sericant of euerie bante, the charge to drawe the forth in Shleues, and so cause one to march close by by another, till all the battailles be furnished, placing the Ensignes alway and Drummes in the middle ranches of the battayles

He neede neuer take care to order his Shot in any forme of Battayle, but only to put them into certayne Wings, and  
euerie



euerie Wing to be diuided into sundrie petie Troupes of twentie or fīue and twentie men a pēce, and euerie of these troupes to haue a Leader or Corporall. And to maynteyne a Skirmish, first one Corporall marcheth forth, and bringeth to the face of y<sup>e</sup> enimie his little Troupe, who presentlie discharging, retire themselues: and in place of them, another Corporall with his companie presents himselfe, continuing this order of Supplie, till the firste haue charged a gayne: and in this sorte maye they continually maynteyne Skirmish without intermission. But the place being large, it shall be requisite oftentimes to presente manye of these Troupes at once to the face of the enimie, who hauing beliered their Volue of Shot, shall marche away as is befoze sayd, and others supply their place. And this kind of discharging and supplying, maye verie well in the open fīelde bee mainteyned in the Ring march, so as the Head shall be sure alwayes to haue charged, befoze the Taile haue discharged: and thus in a Circular march, the Skirmish all day continued.

In playne ground he should neuer turne out any shot to the Skirmishe, without certayne sēues of Pikes to garde them vpon the retreat from the charge of Horses, and also certaine small Troupes of short weapons, as Swords and Targets, Halberts, or suche like, to backe them, if at anye time they should come to the Sword, or to y<sup>e</sup> pēle meale with their Enimies: and such of the Romanes were called *Vindices*. But if euerie shotte hadde likewise at his backe a light Target to vse with his Sword whē he saw occasion, it were much the better.

Our Englishe Bowes also to gall and disorder a Troupe of Horse, may serue to very good purpose, but they must bee garded with Pikes, &c. euen as I haue already declared of other Shotte.

Item, the Serieant Maior by his office, is to appointe euerie Captayne his place, some in the Fronte, some in the  
D,
Rereward,



Rerewarde, some to leade Shotte in the Wings, other to guide the Forlorne hope, and all these are accordingly to put in execution his commaundement.

He ought to be allowed certayne experte Gentlemen, to attende alway vpon his person, to employ this way or that way, as occasion is offered, and these should be men of suche perfection, as are able presently to conceyue, and liuely to expresse any thing y is vpon suddaynes to be done, touching the changing of the Arrayes, or other seruice whatsoener.

For the better execution of these, and many other impo-  
tante Seruices to this Office aperteyning, if the number of  
Souldiours be great, it is very requisite that this Officer  
haue knowledge in Arithmetike, whereby he maye sud-  
daynely for all formes of Battayles, resolute howe manye  
Ranckes, and how many in a Ranck to frame the Battailles,  
what number of Pikes, of Halberds, and Shot shal be requi-  
site, how many Slesues or Hearles euerie Battaille may be  
resolved into, how many Ranckes of Pikes in the Front or  
Traine of those Hearles, and how many Ranckes of Hal-  
berds to gard the Ensigne. Also vpon sight of the ground, to  
consider whether it be able to receyue suche multitude of  
me: Also what forme of embattayling may best agre vnto  
it. In these and many other questions, meete and necessarie  
for the consideration of a Serieant Maior, I haue before  
shewed how requisite Arithmetike is.

Some vse to create two or three or moe *Serieants Gene-  
rall*, but in truth this officer among the *Romanes* needed  
not, for euerie *Colonell* for his owne bandes was a *Serieant  
Maior*, and for ordering of the whole, in the day of *Bat-  
taile*, the *Generall* himselfe discharged it, and all inferioure  
officers knew so wel their duties, that such officers would  
among them haue bin reputed meere superfluous.

The

The office of the Lieutenant or Generall of the Horsemen. Chap. 10.

**T**His Officer hath vnder his charge all sorte of Horsemen, as well the light Horsemen and Demilances, as the Men at Armes, and Barbed Horses, seruing to breake into a Battallion of Pikes, or to backe the other Horsemen being repulsed. And albeit I meane not in this place particularly to entreate of the severall charges of enery Captayne of light Horsemen, Demilances, and men at armes, yet thus muche I thought good to note, that a Captayne of an hundred men at Armes may be compared with a Coronell of footemen, and other Captaines of lighte horsemen, with the Captaynes of footemen, subiecte to the Coronell. And as it is the parte of the Coronell to haue a speciall regard to the arming, lodging, and trayning of his footemen: so is it the dutie of the Captayne of men at Armes, to foresee, that neyther they be disfurnished of their Horse and Armour, with other necessities, ne yet untrayned in al such militaire exercise as to their profession is agreeable. And this Lieutenant is to ouerse the actions of these Captaines, and to giue order in what sort, in what place and time they shall exercise their bands.

He ought immediately after his entring into charge, to haue a Roule of all the Bandes committed to his gouernement, with the names of their Captaynes, and then to peruse their furniture, if it be good to allow thereof, otherwise to make the High Marshall and Generall priue of the default, that it may be amended.

He shall giue order to the Captaines vnder his charge, that fro time to time they aduertise him of their defaultes, eyther of mē, horse, or armour, y he may prouide for supply.

He must dispose his severall sorts of Horsemen in severall troupes, the Barbed Horse by themselves, Demilaces by themselves, & of his lighte Horsemen, the Hargabuziers in

a severall troupe from the rest. And hèrein I can compare this Officer with the Sericāt Maior, bicause he is to receiue his direction from the Generall, or High Marshall, euen as he doth, and then according to the order resolved on, to dispose of these Bands.

He is to appoynte whiche bands of Horse shall go to the watch or scouradge, & must accordingly prouide, that they which watch the night, may rest the next day & night, and others that haue rested, supply their places, in such sort, that freshe men may alwayes be employed in the seruices, and the weered to take their rest, for neyther Man nor Horse without their conuenient rest can continue any long time.

Also so soone as y Trumpet shall sound in the morning to make readie the Horse, he shall forthwith repaire to his Generals Tent to know his pleasure, and then immediately to set forth his Generals Standerd, and cause all the Horsemen forthwith to repaire to that place, and as euery Captayne shall come, he shall cause them to put their bands euery one after his Standerde or Guidone, into a certayne number of Ranckes, that the said Lieutenant may readilie at euery sūdaine draw forth any nūber of any sort of horsemē that hee shall be required by the Generall or High Marshall.

The Lieutenant ought in the morning, to giue notice to such horsemē as he intendeth shall watch y night ensuing, to the end they may feede and spare their Horses that day, and also rest theselues, that they may y better be able to do such seruice as they shall the night following be enioyned.

When the high Marshall goeth to view the ground to encamp vpon, it is the Lieutenants dutie to select a conuenient Band to attend vpon his person, and to appoynt suche a Companie, as maye afterwarde take their rest, and feede their Horses, till suche time as he shall deliuer them to the Scoutemayster at night, who then shall enioyne them what to doe all the night after, and shall also deliuer them theyr Watchworde.

This



This Lieutenaut ought all the daye, whiles þ Battels marche, diligently to note the orders of euery Band, and if he see any disorder, forthwith to sende for the Captaine, and cause him immediately to see it redressed. Also at night when the armie entreth into the Campe, the Lieutenaut shall first cause the Horsemen to keepe the field, til al the Footmen be encamped, then maye he enter with his Bands of horse orderly, causing first one Band to enter, and al the rest keepe the fiede, and when they haue their conuenient place, then another Bande to enter, and so orderly to place themselues. Wherein the Lieutenaut is to foresee that the last Bands be not worst lodged, but suche conuenient place left, as they haue no iust cause to complayne.

He oughte also to giue order that the Scowrs come not out of the fiede, till the Trumpet sounde to the Watche at nighte, nor then neyther, till such time as they shal perceyue the Scout or Sentinel to be come from the Campe, and to haue take their places in the field: Then may they returne into the Campe.

He ought also to assigne a sufficient number of Horse to attende on the Forrage maister, to garde and defende the Forragers, which Horsemen must not come out of the fiede, till all the Forragers be returned to the Campe with the Forrage maister. Then shal these Horsemen reste, and not Watche neyther that nyghte, nor Scoure all the nexte day.

He is also to appointe a reasonable Conuey of Horsemen, for the safetie of such as bring victuals to the Campe, to see that no violence or iniurie be offered vnto them, and so order the chaunge of his Horse in these seuerall seruices, that some be not ouer burthened, and others ouer-spared, but þ matter so indifferently vsed, that men haue no cause of murmuring or repynning.

In making of Rodes with Horsemen only, he should first sende out light Horsemen, Argoletiers, and such like to dis-

couer the Enimie : then to diuide his Launces into diuers Squadrons, & one of them to follow another a good distance. Of euery side of these masse Squadrons shoulde be a pretie distance from them one ranke of Argoletiers. In this sort if one Squadron happen to be broken, yet shall another make good vpon the Enimie while they may retire and Troup againe which is the onely safetie as well of Horsemen as Footmen.

And albeit in the day of seruice it is the part of the High Marshall himselfe to giue order in what sort, and with what Troups the Charges shall be giuen or recepued : it is also the Lieutenants parte as well to giue his aduise, as also to be a Leader in al these Actions.

He ought therefore to take great regarde to the groundes where he meaneth to giue the Charge, for if he charge in Troupe, the falling of a fewe Horse in the foremost rankes may disorder and foyle the whole Troupe.

He muste not giue charge before the Fronte of his owne Footmen, for it hath bene seen that Horsemen being repulsed, haue bene forced in vpon their owne Footmen, and disordered them. Let the Horse therefore charge vpon the Flanck of the enimie, and diligently attende if by any accident they can perceiue any breacking or opening in the side of his enimies Battaille, & then sodenly to charge that breach: for as Horsemen shall smally preuaile vpon Footmen well ordered, so vpon any small disorder, they carry with them certaine victorie.

I like wel the maner of the Germanes, who keepe alwayes their maine Troupe standing, and cause only one ranke from the Front to charge, and the same being repulsed to retire to the tayle of the standing Troupe, and the another to charge and retire to the Tayle, as the former, wherby they maintayne the whole Troup in full strength, til they see the Footmen swaye or breake, and that they Horsemen enter.

Then presently they backe them with an other ranke,  
and



And those againe with another, til they see cause eyther to followe with the whole Troupe, or to staye. And this is the surest and most orderly forme of charging of all others. Albeit it sometimes also the Ruyters vse to wheel about with their whole Troupe, and every ranke one after another to give the Enemye a volue of their Pistols.

For execution of Justice on suche as are offenders in any Bandes of Horsemen: Albeit in some Countries it bee used that every Captaine of an hundred men at Armes may call vnto him certaine of the chief of his Band, & heare and determine all causes, and offences by any of his Bande committed, yet surely I holde it more convenient, that all matters concerning life, be heard by the high Marshal, who maye cause to sitte wth hym the sayde Captaine whose Souldiour is to be adiudged, and suche other of the sayde Bande as to him shall seeme meete, and the Souldiour condemned to death, to be executed by the sayde Band, even as the footemen are: and by the same kinde of weapons that the offenders used.

This Officer among the Romaines, was called *Magister Equitum*, or *Præfectus Equitum*, he had the charge both of the Barbed horses, called *Cataphractos*, and also of the lighte Horsemen, which they named *Expeditos Incursores*. His Office was not only in the fildes to see his Captaines vnder him to doe their ducie, but also in the Campe to trayne theyr Bandes in all Militarie exercise and Actiuitie.

The



The Office of the Maister of the Ordinaunce. Chap. ii.

**T**His Officer being one of the principall Officers of the field, hauing the charge of the Artillerie and Munition, ought to be a man of greate learning and experience. His Experience shall make him readie to conceyue and exployte many particular Actions, wherein a very good witte without trayning shall stagger and be amazed. Learned he ought to be in Histories, to consider of manifold Stratagemes that by other noble Souldiours haue heretofore bene vsed: The sundry sortes of Engins to assault & defende: of Bridges to passe Waters, and other ingenious inuentions for conueying of great Ordinaunce ouer Marshes: But especially he ought to haue exquisite knowledge in the Mathematicals, considering thereby he shall be able certainly to Shote at al Randons, to conuey Mines vnder the earth to anye Curtaine, Bulwarke, or other place that he determineth by violence of powder to rente in peces: to supputate and forecast what quantity of shot, powder, &c. shall be requisite for anye Batterie, or other exployte: To set out in due proportion euery particular Fortification, of Campe, Towne, or Forte, where Ordinaunce is to be vsed, whiche cannot possiblye without knowledge in these Sciences be sufficiētly discharged. And that Maister of the Ordinaunce, that is ignorant herein himselfe, and trusteth to skill of others, shal be abused by audacious presumptuous persons, that taking vpon them the knowlege they vtterly want, will shame themselves, dishonour him, and foyle the Enterprise.

He oughte immediately vpon the receyte of his charge to cause an Inuentorie to be made of euery seueral thing, as well to render account therof, as also to consider whether he haue sufficiēt of euery sort of Munition to serue the tourne.

To

To this Officer appertayneth a Lieutenaunt, and certain Clarkes, in wages, who are to attende inferiour causes, rendring accounte of al their doings to the Maister of the Ordnance.

To this Officer it appertayneth to foresee, and from time to time to provide, that there be store ynough for al kinde of necessities to the Artillerie appertayning, as Wheeles for Ordnance, Axeltrees, Ladles, Spunges, Bullets, Chayne-shotte, Crossebars, Corne powder, and Serpentine powder, Mattockes, Shouels, Crowes of yron, Hande axes, Engines for the mounting of Ordnance: Graund Paunds, or Gabions, little Handebaskets, Hoopes, and all other Cartes, ware.

Item, to haue such Gunners as are not only skilful in the readie maneging of their Peeces, but also in the making of Trunkes, Baules, Arrowes, and all other sortes of Wilde-fire, and for the continual supply of them, they ought to haue in readinesse greate store of Sulphur, Salte Peter, Rosine, *Calx viue*, Lintseed oyle, and common lampe oyle, Pitch, Tarre, Camphire, Mace, Tutia, *Arsenike*, Quick-silver, and *Aqua vita*. Hereof let them frame Baules of fire to burne in the water, Cressets and Torches that stormes or winde can not extinguishe, murdering Bullets to be shot out of great Morter peeces, and such like.

Item, that euery peece of Ordnance haue his conuenient number of Horse or Dren to drawe the same, and Carters also to guide and keepe those Beastes.

Item, that euery Peece haue his Gunner or two to attende thereon, to charge, dyscharge and mount the Peece, also to wadde and ramme, to cleanse, scour, and cole the Peeces when they are ouerheated: & for this purpose they shall haue in readinesse Spunges, Winegre, and colde water. &c. And for these Gunners, there should be one Master Gunner to ouersée them all.

P.

Item

Item that if anye Bande in the Campe want Powder or Shotte, the Maister of the Ordinaunce vpon request of the Captain, is to giue order that his Clarkes deliuer the same, taking a Bil of the Captaines hande for their discharge, the which Bil must at the pay daye be deliuered to the Treasurer who is to stoppe so much vpon the pay of that Captaine and his Bande.

To this Officer it also appertayneth to haue in readinesse certaine Boates made for the purpose with flat couers of square Planches, whiche chayned together maye make suddenly a Bridge, to passe an Armye ouer any water: He ought not to be disfurnished of Cables, and Anckers, to let fall in anye swifte or violent streame to holde the sayde Bridge.

The Maister of the Ordinaunce is alwayes to haue attending vpon his charge a sufficient Band for the Guard of the Artillerie, & also Pioners to make redy the way for his Cariages, and to entrench the place in the Campe that shall be ( by the Prouost Marshall ) assigned for the Munition.

Item, that there be of Wheele wrightes, Carpenters, Coopers, Smythes, Bowyers, Fletchers, Masons, and suche other skillfull Artizans with all toles necessarie and needeful, to preserve, repayre, and make all suche things as to the Artillery and Munition appertayneth.

In the felde, whensoever any day of seruice is, it is the Office of the Maister of the Ordinaunce, to select a convenient place to plant his Ordinaunce, as well to annoy the Enemy, as also to be in suche sort guarded and fortified that it be not surprized of the Enimie.

Item, in the Campe, he onely oughte to giue order for the planting of the Artillerie, and Fortification of the Flankers. And that the Ordinaunce be planted to the best aduantage, and also to foresee that the Maister Gunner and other Gunners do theyr duties whyche doe appertayne to theyr

Office.



**Office.**

Item, in the besieging of any Towne or Fort, he onely oughte to dispose and giue order for the planting of Artillerie, to make the Batterie, and to foresee that they be well fenced with Gabbions and Rampiers of earthe, and so placed, that the Curtaine maye with most speede and least charge be battered and ruinate.

Item, that al suche Peeces as are vpon any mounte within the Towne planted to the annoyaunce of the Campe, maye be dismounted, and the Flankers cut of before any assault be giuen.

Item if there be any possibilitie to approach the Towne by Myne, the Maister of the Ordinaunce only ought to giue order for the accomplishing of the same. And the Captayne of the Myners and Pioners is to folowe his direction.

Finally this Office is of great reputation in the fielde, and the execution and exployting of great seruices dependeth thereupon. But bycause it is neyther possible nor conuenient that the Maister of the Ordinaunce shoulde attende all these thyngs himselfe, he maye committe inferioure causes to the execution of his Lieutenaunte, reseruing alwayes to himselfe the disposition of the great and most important.

I Mighte here adioyne sundrye Tables, and collections of al sortes of great Artillerie, what Bullets, Wadders, Rammers, Ladles, Leuers, & Barrels of powder, what Wheels, Axeltrees, Chaynes, Corde, and all other arming, and furniture for Carriages, to euery kinde were conueniente to bee hadde in readinesse, what Oxen and Horse to drawe them, Pioners, Carters, and Gunners to attende them: *Instruments* and Arte to mounte them, Gabbions to defende & guard them, wyth sundrye

receytes and compositions of Trunkes, Arrowes, Balles, Barrells, and other Engines of fireworkes &c. both for *Offence* and *Defence*. But hauing in my Treatise of *Pyrotechny*, & great *Artillerie*, prepared at large to handle euery of these particularly, and to supply the wantes of this Office fullye, meaning in this Treatise but generallye to touch and giue a taste onely in each degree of our wants and imperfections. That our *Nation* may not alwayes rest drowned in this ignorance, and secure dreame of *Antique valure*, while all oure neighbours rounde aboute vs *Arme, Traine* and *Fortifie*. Till I may haue time to finish that *Treatise* I leaue further to en-  
treate of this matter.

### Of the Maister Gunner.

**T**He Maister Gunner is but an vnder Officer appertayning to the M. of the Ordinance: And his office is, to see all the inferior Gunners to do their dueties, to be skillful and ready in their charging, dyscharging, cooling, leuelling, and mounting of the Ordinance: and to haue in readinesse Bullets & Pouder, Ladels, & Spunges, to *Mad, Ramme, Coole* & charge the *Peeces*, also to peruse the Carriages, and *Wheels* that they be strong, and the *Peeces* themselves, that they haue no hony combs or flaws in them, whereby they should be in danger of breaking. To haue in store Crosse barres, Chayneshotte, Cases of Haileshot in manner of Cartages, Trunkes and Baules of Wildfire, with Artificiall Barrells of pebble stones charged with pouder to throwe into ditches, or to defende a breach upon any sodaine attempt: These and such like are matters for the M. Gunner to occupie himself in, and to make proofes of them in presence of the M. of the Ordinance, that he may see the effect and violence of them.

These Officers among the *Romans* were not, because *Ordinance* is newly inuented, and to them vnknown, but  
in stead



in stead of *Artillerie*, they had *Arietes*, *Scorpiones*, *Balistæ*, and *Arcubalistæ*. They had also *Testudines*, *Turres*, and such like *Engins*, whiche in beseiging of Townes, and other seruices, they vsed. But all these are now out of vse, and serue in deepe to small purpose. The force of *Ordinance* being suche, as the *Fortification* of Townes in these dayes is cleane contrarie to that of the *Antiquitie*, and *Romane Præcedents* therein can nothing pleasure vs.

### Of the Lord high Marshall in the fielde or Camp. Chap. 12.

**T**He Office of the High Marshall is of greate importance, and hath the direction of the greatest, and most important matters in a Campe. To him apperteyneth the true administration of Iustice, the hearing and determining of controuersies, and the punishing of disorders. And therefore as he oughte of himselfe to be a man both graue, wise, learned, & thoroughly well experienced in Martiall affaires, so is it also conueniente for him to haue about him men of iudgemente, skillfull in Militare discipline, and lawes of a Campe, readilie to resolute of euerie question, according to Equitie and Iustice.

Farther, this is to be noted, that the particular Lawes of any Prouince, ought not to bind the Souldiour in the fielde, but euerie Campe oughte by prudent consideration of the Generall, and his Counsell, to haue lawes set downe and decreed, yea, and the same to be published by open Proclamation, that all the Camp may haue notice thereof.

Some thinke it necessarie also, that not onely euerie Captayne and Coronell should be sworn to the said Lawes, but after the old Romane manner euerie particular Souldiour at his entring into pay to take his Oth. For which cause, the Romane warfare was termed *Militia Sacrata*.



The high Marshall so soone as he hath receyued of the Generall the names and numbers of all the Bandes of Horsemen and Footemen that are in the Armie, he must leardnedly proportion and cast what scope of grounde wyll suffice to encamp them, with all their Prouision, Carriadges, Munition. &c. wherein he ought to obserue suche a discrete meane, that neyther for want of due room the Souldyers be pestered, nor by ouerlardge space, the Campe not sufficiently Fortified.

This being one of the most important matters that the high Marshall hath to consider of, it shall be requisite for him to haue knowledge in Geometrie and Arithmetike, and to haue in readinesse sundrie Plattes, Models, and formes of Campes, whereby he shall suddaynely resolute for any number or Scituation, what forme and quantitie of Camp is most conuenient, and presently stake it out, assigning due place for euery Regiment of Footemē and Horsemen, Carriadges, Ordnance, Munition, and euery particularitie, as hereafter shall more playnely be declared.

When the Armie shall remoue, the High Marshall must first giue order to the Maister of the Ordinance, that he set forth the Artillerie, with al the Carriadges, Munition. &c. then the Mayster of the Victuals, and Carriadges afterwards.

Afterwarde he must giue order to the Sericant Maior in what sort he will haue the Battaile to march that day.

Item, he must giue order to the Skoute mayster whiche way he shall send his Vanquersers to discouer, if all be clære, who must from time to time giue intelligence what Occurents he discouereth.

The High Marshall must assigne euery Battayle hys Guide or two, to conduct them the best and most easie wayes.

Item, he must appoynt some conuenient number of Pioners to attend vpon the Ordinance to clære the wayes for the.

The

The High Marshall when he goeth to view the ground where he intendeth to Encamp, may by his authoritie take such number of Horsemen, as he shall thinke conueniente, and then is he to consider, that there be nigh at hand Wood, Water, and Forradge ynough for the Armie. And if he intende long to lodge in that place, then must he make his Camp the larger, and prouidently consider that euerie Regiment haue his conuenient place. That the Tentes be not pitched nigh the Ring of the Campe. That there be large places of Assemblie within the Camp. That it be well Entrenched and Fortified, whereof I will more particularlie speake in the Description of a Camp.

For lodging of Horsemen, especially in a running Camp, it is not amisse to imitate the Ruyters, who commonlye alwayes lodge in such Closes, as they finde enuironed wth trees, or quickset hedges and ditches, placing their Horses in due order round about the field, two pases one from another, with Rayles betwene them, leauing all the boyde ground in the middle for the Captaynes Tentes, and Cabbins for the Horsemen.

In this sorte in a field of two or thre acres, I haue seene a two hundred Ruyters verie commodiously lodged, wth Rayles or Poles betwene their Horses, and Boowes about them, to defende them from the wind. Some with Hales ouer them, to keepe them from the Rayne, their Saddles, Bridles, and all other their Furniture hanging vpon Poles readie by them, neatly kept, and blacked, their Mangers also before them. For al such necessaries the Ruyters carrie with them in their Carriadges, besides, little Wheelebarrowes to carrie away their dung, so that their Campe is no lesse cleane and orderlie, than a Princes Stable. A faire streete they alway leaue betwene their owne Cabbins, and their Horses.

The

## The Ruyters manner of Lodging.



They haue certaine Troupes of their Seruants, whome they call their Kneyghts, and these Troupes alway attend, that so soone as the Marshall hath limited their Quarters, they departe immediatlye to the next Woods, for Poales, Boowes, Stakes, and other necessaries, to build their Camp, Stables, and Cabbins. Other goe for Forradge, that before the Armie approach, their Lodgings are alwayes in readinesse. To euerie twelue Ruyters commonlye, there is allowed a Wagon with four Horse, or to sixe, a Carte, with two Horse: and their Kneyghts are about one thirde parte of the number of their Horsemen.

The Lance Kneyghts also encamp alwayes in the fieldes verie stronglye, two or thre to a Cabbonet, they Pykes and Armour standing by them in readinesse, and so orderly placed with stretes so conuenient and cleanly preserved,



ned, that their Camp is no lesse holosome than strong.

I haue sene aboue.3000.of these *Lancekneyghts* lodged in three or foure acres of grounde, whiche *Proportion* differeth not much from that of the olde *Romanes*.

The high Marshall,aswel for the ordering of Scoutes as al other matters of importance in the Campe, is to giue order, and at the setting of the Watche his Trumpets oughte first to sound, and then all the residue of the Trumpets in order to answere euery one in his senerall Quarter. And in the morning all the Trumpets should assemble befoze the Lord Lieutenaunte Generals Tent, and there to sound the reliefe of the Watche. But no man vppon paine of death muste remoue from his charge till the Warders be come oute: then may euery man departe to his rest.

He ought to giue order, that such as come to victuall the Campe be well bled, and truely paid, and that vpon Victuall some reasonable price be seazed: and that suche a place bee assigned for the Butcherie, as annoye not the reste of the Campe.

Item, in the field at a day of seruice though there be a Generall of the Horsemen, yet is it the place of the High Marshall to serue there as chiefe, and to appointe into how many Troupes the Horsemen shal deuide themselves, and which shal Charge, and which stand for their Rescue.

Item, if any Prisoners be taken in the fiede, they ought forthwith to be Enrolled in the Marshals Booke, and then if any man make claime to any other mans Prisoner, the Marshall as Iudge to determine who shal haue him, and for euery Prisoner brought into the Martialsca, and enrolled in the Marshals Booke, his fee is.8.s.

He is also to haue of all Booties taken in the fiede and broughte into the Camp the third part: But aswell for this, as other his fees, they are by the Generall to be limited at the beginning, as shal be thought reasonable.

¶

Finally,

Finally, the High Marshall oughte to be a man of suche perfection, that he know the duty of euery inferiour Officer, and be able to refovrme their misdoings, and that of his own knowledge.

He shoulde make choise of a good Prouoste, to whome he may committe the handling of smaller matters, alwayes retayning the greater causes, and such as concerne Life, to be heard by himselfe: And for his greater reputation, and to be knowne from other Officers, he shoulde haue in the field bozne before him a Cornet.

And forasmuch as to this Officer chiefly the execution of Militaire Lawes appertayneth, I will briefly here adioyne suche Offences, as by law of Armes are to be punished with Death: For other that are not so haynous, the Marshal may by imprisonment, or otherwise at his own discretiō chastise.

### Offences to bee punished vwith paine of Death in euery Camp or Armie.

**F**irst, whosoener committeth or conspireth any Treason againste the Generall: Or giueth any aide to his Enimies: Or vseth any conference with the Enimie without expresse licence from the Lieftenaunt Generall, or one of the Lieutenauntes of the Horse or Foote Campe.

Item, whosoener shall discover any matter of Counsell, whereby any incommenience may ensue: Or shal sende any letter to the Enimie without leaue of those Lieutenants: Or shal receiue anye importante Intelligence, and doth conceale it from the Generall so any ill intente.

Item, whosoener shal fly from one Campe to another: Or beeing taken of the Enemy shal not escape when he may: provided alwayes that after he hath giuen his faith to be true Prisoner, it shal be lawfull for him to obserue it.

Whosoener shal Trayterously or Cowardly render vppe anye  
Town,

*Town, Forte, or other place committed to his charge, being founde by due triall, that it might haue bin kept.*

*Whosoeuer shal break any truce with the Enimies: Or shal lay any violent hands vpon any Officer his superiour, vnlesse it be for defence of himselfe, his life being in apparant peril.*

*Whosoeuer shal kil his Souldior vpon malice without iust cause: Or kil any other of the Camp, otherwise than in his owne defence.*

*Whosoeuer shal go about to make any Mutinie: Or shall disobey the foundes of Trumpet or Drumme in time of seruice, especially when they are made vpon paine of Death.*

*Whosoeuer shal forcibly abuse any woman: Or take any spoile without leaue: Or enrolle hymselfe in twoe Bandes: Or passe twice in one Muster: Or parte from Bande to Bande without licence of the chiefe Officers: For the Captaines haue no aucthoritie to giue such leaue.*

*Whosoeuer shal not folowe his Ensigne: Or abandon the place he is assigned, whether it be in Field or Watch: Or shall sleepe in the Scoute: Or shal reueale the Watcheword to the Enemy.*

*Whosoeuer being placed in Watche, Scoute, or other place of importaunce so behaueth himselfe, that by his default the Camp is sodainly without notice assaulted: Or being appointed to the keeping or defending of the Trench, or Breache, and shall abandon the same.*

*Whosoeuer shall spoile any Victualler or other person oute of the Camp, being not of them that are declared Enimies: Or shall play away his Horse or Armour, wherewith he is enrolled: Or flying away shall loose the same: Or anye other waye by his owne default shall be of that his Armour disffurnished.*

*Whosoeuer quarrelleth with any Souldior placed in Watche, or other places of importaunce: Or runneth to any quarrell with any other Armoure or Weapon than his Sworde: Or being thrice commaunded to cease, and departeith not.*

*Whosoeuer rettreth not immediatly vpon the sound of the Retreat, maketh noise when Silence is commanded: Or passeith ouer any Wal or Rampire forbidde: Or lodgeth any sträger in his Tent*



without leaue from the chief Officer: Or sayneth himselfe sicke whē he is commaunded to the Battel, or other importante service: Or absenteth himselfe wilfully from the Militare exercises.

For al other inferiour faults, as Dicing, Carding, Rayling, Slandering, Quarreling, beastly using themselves within the Campe, and such like, the Prouost Marshall is to punishe them, who should haue Tipstaues attending on him, presently to apprehend such disordered persons, and to carry them to Warde.

The Maister of the Pioners, the Trench & Mine Maister, are Officers wholly depending on the High Marshall, and are not to doe any thing of themselves, but onely to see that their companies and people committed to their charge haue their Furniture in good order, and doe the worke they shall be enioined diligently. But of themselves without Warrant these Officers can do nothing.

I Find not among the antient *Romanes* any Officer vnder the Generall of so greate reputation as this Lorde Marshall now is, for albeit they had *Censores* and *Anticensores*, which in some sorte may be compared with the Marshall and hys Prouost, in respect that they made choyce of the grounde to encampe the Armie on, and also distributed the *Quarters* & *Regiments*, yet were they far in dignitie inferiour. And thys Officer was first deuised (as I iudge) to supply the imperfection and ignorance of the *Generals*, and after continued for their ease to disburthen them of those *Cares*, wherein the *Romane Generals* tooke greatest *Fælicitie*: And were then no lesse ialous that anye inferiour person shoulde participate wyth them of those honourable trauels, than *Generals* are now desirous to disburthen theselues of al cares and paines. And althoughe together with the Ruine of the *Romane Monarchie*, *Militare Discipline* in *Europe* for these thousand yeres hath bin in effect quite extinguished, yet some worthy persons in all ages haue sought somewhat to reuiue the same: As may appeare by the *Prince of Conde*, and *Admiral of Fraunce*, whose

whose *Discipline* for their *Campe*, briefly I haue thoughte good here to adioyne, bycause it somewhat sauoureth of the *Antique Romane*.

**The Lawes and Ordinances for gouernment of the Armie vnder the conduct of the Prince of Conde, in the ciuil Warres of France. Chap. 13.**

**The othe ministred to all the Nobilitie, and Gentlemen Captaines, and others within their Armie.**

**Y**E shall sweare before the Liuing God, that for the causes and occasions contayned in the Protestations made by the Prince of Conde, yee shal aduenture your Bodies, Lynes, and Goodes, and al other meanes that God hath giuen you, vnder the charge and obey-saunce of the saide Prince, whome yee knowledge as Chiefe, and Conductor of this Armie, yee sweare and promise your obedience to all, whatsoeuer shall by the saide Prince or such as beare charge or office vnder him be commaunded, to obserue duly al suche Militare Ordinaunces as by them shall be prescribed for the gouernement of this Armie &c.

**T**He Prince hauing by experiente founde, that no Armie can be wel led and gouerned, if it be not well ordered, ruled and disciplined, and the same not possibly to be done, if at the firste good Lawes and Ordinances be not prescribed: And if suche things haue bin obserued among them that had no knowledge of God nor of true Religion, muche moze oughte these things to take place among those that make profession of True Religion, who ought to be as a Precedent and Patterne to others in al right and Iustice, and not in disorder.

*Q. iij.*

and



and dissolute living, as in our laste warres, and euen verpe lately also hath bin seen: For this cause y<sup>e</sup> Prince being willing to discharge as farre forth as in him lyeth the duty and charge that God hath committed vnto him, being duly ther vnto called, after he had assembled the mosse notable and best able Gouvernors, Captaines, and other of the best iudgement and vnderstanding of all suche as were to be founde in his Armie, hath agræde vppon these Articles and Ordinaunces ensuing, the whiche his pleasure is shall be precisely in euery pointe obserued and kept vnder the paines in the same articles containned.

And if any suche be, as peraduenture shall not like to allowe of them, the Prince meaning not to compell any, but by voluntarie obedience, giueth them free warning to retire themselves out of hys Armie, meaning that all suche as shall remaine vnder his conducte shall inuolably obserue al these his Lawes and Ordinaunces, the whiche he will see indifferently executed vpon al sortes, withoute regarde or respect of persons.

And firste the Prince enioyneth al such persons (whether they be Horsemen or Footemen, Gentlemen or others) if they be not of y<sup>e</sup> nūber of those that haue Charge, that they Range and Enroll themselves vnder some one Cornet or Ensigne, there to take their Othe as is appointed for them, and that within five dayes after they shall appoche the Armie: Otherwise if they be founde in default after the saide time, al their Armour and Horse to be to the proper vse and benefite of him or them that shall bewrape the same to the Prince or to the Marshals of the Campe.

And all suche as shall cause themselves to be enrolled, shall be bound to obserue and performe theyr duty in Watch, Scoute, and Scourage, accordingly as shall be ordayned by the Marshals of the fielde, their Captaines, or other Officers hauing charge ouer them, vpon paine, if they disobey, to be disposed of theyr Armour, the whyche shall be confiscate  
together



together with their Horses to the vse and benefite of their Captaines.

Neither maye they that haue taken their Othe departe from their Cornets or Ensignes without the leaue and permission of their Captaines the whyche they muste make apparant before they be elsewhere receiued: And if any shal do otherwise, the Captaine from whom such are departed, shal cause them to be brought before the Prince, who shal take suche order for recompence betwene the Captaines, as to him shal seeme mete: And touching the offendours, their Horse and Armour shall be confiscate to the vse and commoditie of the Captaines from whome they are in such sorte departed.

And to the end no man be vnawares surprisid with this daunger: The Prince commaundeth all his Gouvernors, and Captaines to cause dayly these Ordinances to be published, and made knowne to suche as from time to time shall newly come into the Armie, and Range themselues vnder their Cornets or Ensignes.

And bycause some Captaines maye happily abuse or yll handle their Souldiours: The Prince permitteth them notwithstanding their saide Othe, vpon iust occasion to demaunde leaue of their Captaynes to departe: And vpon refusal or deniall, to repayre vnto the Prince, who hearing either parte, will take suche order as shal seeme vnto him reasonable.

And to the ende all things maye with good order be directed: the Prince willett and commaundeth, that this Othe by him ordained, shall monthly be renewed, and that if there be any Gentleman or Souldior that will abandon his Captaine, it shal be lawfull to declare the same before hym that shall be appointed Commissioner to take the Muster and giue the Othe, who maye giue Licence to the same Gentleman or Souldiour, if so be that he finde no Doubte or Difficultie by reason whereof he thinketh it conuenient

to referre the same to the Prince himselfe, or suche as shall expresse from the Prince be assigned to examine suche Debates and Differences: And in the meane time, the Prince expressly forbiddeth all Captaines and Gouvernors to practise or suborne one anothers Souldiours.

And to discover suche as shall departe the Armie without leaue, the Prince enioyneth and commandeth the Commissioners that shal reuiewe the Musters, monethly from time to time to presente vnto hym the Roules wherein shall bee written the Names and surnames, together with the abode of euery person, to the ende such as shall be found culpable of suche faulte and infidelitie, shall publikely be denounced and declared Enemies of God, and traisterous forsakers of the cause.

And forasmuch as the Prince desireth nothing more than to cleare his Armie of Magabonds, and suche vnnecessary people, he expressly forbiddeth al persons to folow his army, that are not Enrolled, and orderly aduowed, the which they shall sodaynelye make manifeste whensoever it shall bee demaunded by signed Certificates. The Footemen and Horsmen to haue their Certificates from their Captaynes: the Lackeys, and seruantes from their Maisters, and the Victuallers, Merchantes, and Artificers, from the Prouostes and Campe-maisters, vpon paine that whosoever shall after three dayes ensuing the proclamation of the Premisses, be founde wythout the said Certificates, he shal be hanged and strangled.

And to the ende euery Captayne and Gouvernour may the more easily render an accompte of such as shal be subiect to their charge, being very hard to command more than 100. horse, The Prince willeth & ordaineth, that no Cornet shal haue any greter number: And neuerthelesse, if any Gentleman by reason of the good wil which shal be boyn vnto him, shal haue any greater numbers to folow them, The Princes pleasure is, they shal diuide them according to that rate of  
hundreds



hundreds, appoynting their Lieutenants accordingly. And as for Foote bands euery Ensigne to cōteyne 200 souldiers. The Prince also expressely forbiddeth all that serue in his Army, to go to any seruise or enterprise without leaue, vnder payne if he be a Captayne, to be depriued of his charge: if he be a priuate Souldiour, to be depriued of his Horse and Armour, and banished the Armie. As he doth in like manner forbid all souldiours of his Armie to abandone their Cornets or Ensignes, ordeining y<sup>e</sup> such as shal be found from their said Cornets or Ensignes spoyling, forradging, & Praying, to be corporally punished as robbers & Thieves, and breakers of these Ordinances, and their spoyles, together with their Horse and Armour, to be to the vse of suche as shal bring them befoze the Prince to aunswere their offence.

And for as muche as this Warre being of an other Nature than others Warres, ought also to be ruled after another fashion, The Prince commandeth, that all Prayes and Booties shal be brought and put into the hands of such persons as shal be by him deputed and assigned, to the end the commoditie and benefite thereof resulting, may reasonably be diuided and imparted to the mayntenance of the Warre, and reliefe of such as shal haue neede thereof. Provided alwayes, that if any such Enterprise be made, as the Souldiours giue Battayle or fight for it, that then the Bootie shal be diuided, according to the auncient lawes of the warres. And for al other Prayes and Booties, one Third to remayne for the Captaynes and Souldiours, and the other Two Thirds for the publike cause and maintenance of the Armie. And if there be anye that do conceale anye parte of the Bootie, the Prince his pleasure is, that some honest, present, and consideration (according to the value of the thing) be bestowed on the reuealer of the faulte, and the concealer to be corporally punished as a Thiefe, and Enemie to the cause.

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The Princes pleasure is also, that all compositions of Villages, Castels, and other things of like nature and qualitie be committed into the handes of hym or them that shall by the Prince bee therevnto deputed, to bee by them converted to the vse before mentioned.

And for as muche as great abuse is often committed in the taking of Booties, the Prince ordeyneth, that nothing shall be reputed, or declared Bootie, vnlesse it be verifed and duely approued by those of the Counsell, and made apparant eyther by some such as were taken, togyther wyth the Bootie, or by some other good and sufficient Testimonie.

And to the ende all suche thyngs (of what nature soeuer they bee) that shall bee receyued, shall truely and saythfully bee handled and distributed, The Prince wyll chouse some one principall personage of good qualitie and reputation, who shall keepe a Roule or counterpane of all suche things as shall be receyued.

And bycause there are manie that entertayne a greater trayne than they ought, vnder coulour that they line at Discretion, the whych full ill agreeth with the profession of our Religion, and ingendzeth greate confusion in an Armie, and sometime danger and losse, by reason of the great superfluitie of baggadage. The Prince exhorteth and admonisheth all Gouernoures and Captaynes, be they Horsemen or Footemen, to bee diligente and carefull in searching and examining the state of thynges, and not to permitte anye to haue a greater trayne than is necessarie. &c.

And for as muche as all disorders do principallie growe by reason of the excessive traynes and baggadage that Footemen and Horsemen carrie with them, who commonly doe vse to robbe and steale Horses, and other labouring Beastes, to carrie theyr Pilladge. The Prince willet and commaundeth, that none shall haue moze than one Seruant

nant oꝝ Lackey foꝝ euerie thꝛee Shouldeyours at the most, and those also to bee bound to followe the Ensigne as well as theyꝝ Maysters, and not to stray from theyꝝ Quarters, vppon payne of hanging and strangling. Neyther shall it be lawfull foꝝ them to serue theyꝝ turne with Horses, Oxen, Asses, oꝝ suche lyke, the whyche hee declareth, and ordeyneth to bee confiscate and forsaite, if theyꝝ proper maysters, to whome they ought indeede to bee restored, doe not challenge them. Onely vnto Captaynes and Officers foꝝ theyꝝ owne proper vse and commoditie, the Prince doth allow the vse of them.

And to pꝛeuent and meete wꝛth suche abuse as maye growe by dissimulation oꝝ wincking at suche faultes, the Prince hys pleasure is, that those hys commissioners also shall Muster and reuiew the sayde Traynes and Baggage, and refoꝛme and cutte off that shall seeme vnto them superfluous, and of them to make a Register, to the ende thereby moꝛe easilie the offences committed agaynst the pꝛescribed orders, maye be discovered. And in the meane time, considering the mischiefe and inconvenience that doth growe by suche robbing and stealing of labouring beastes.

The Prince ordeyneth, that suche as shall be atteynted and conuicted to haue robbed oꝝ stolne anye of that sorte of Beastes, shall bee seuerely and rigorously punished as Traytors and enimies of the publike cause, vnlesse they bee sicke oꝝ hurte, and in that case they are enioyned to make their Captaynes pꝛiue, who shall pꝛouide foꝝ them.

And foꝝ as muche as at the place where the Armie shall firste assemble, they do commonly determine of theyꝝ Enterprises, and debate many other important matters foꝝ the safetie of the Armie marching and lodging, The Prince commandeth all those that haue charge, to be there

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present,



present, and also the chiefe of euerie Troupe, or at the leaste their Lieutenants or Cornets euerie morning to giue their attendance at the lodging of their Chiefes of the Armie, whether it be of the Battaille, or Vawarde, there to vnderstand what is for them to do.

The Prince his pleasure also is, that all suche safeco-  
duites as shall by him, or the Admirall be giuen, shall be re-  
spected and regarded vpon payne of death.

The Prince also expressely forbiddeth all persons to  
robbe or spoyle any Victualers, or other commodities that  
shall bee broughte into his Campe, vpon payne of  
death.

And to the ende that no man shall pretende ignorance  
of these Ordinances, the Prince his pleasure is, that the  
chiefe Gouvernours and Captaynes of his Armie shall  
euerie weeke cause them to be publikely redde, both in the  
Battayle, and Vawarde, and in all partes and Quarters of  
those Regiments, and in all other places of Garrison, or as-  
semble of Souldiours, and the same to be inuolably ob-  
serued in euerie poynte, according to their tenure and true  
meaning, and the offenders to be seuerely for example pu-  
nished, withoute altering, or innouating any of the lawes  
and Ordinances of the Kings Maiestie, as well touching  
the ordering of Penne at Armes, as Footemen, all  
whiche ouer and besydes these presentlly published,  
the Prince commaundeth duely to bee obserued and  
kepte.

These Lawes ordeyned by the Prince, the Admirall,  
and other famous Souldiours then lincked with them,  
I haue heere published, not to the ende euerie Gene-  
rall shoulde bee bounde to the selfesame Lawes, but  
imitating theyr Policie, to assemble theyr principall  
Officers, Coronels, and Captaynes, and before they march  
forwarde, to decree suche Lawes and Ordinances as  
may



may seeme most fitte for the gouernemente of suche people as shall serue vnder them, mittigating or increasing the paynes, as shall be founde meete. And the same to be published, and by *Othe* receiued, as in this *Precedent*, and in the honorable auntient *Romaine warres*, was alwayes accustomed, whereby such extreame disorders, and spoyle of men shal be auoyded, as alwayes is seene in those *Regiments*, where *Discipline* is neglected, and men onely by *Discretion*, or rather by *Fantasie*, directed and corrected.

## The Office of the high Treasurer.

Chap. 14.

**T**His Officer is of greate reputation, and hath to his charge committed the payment of Coronels, Captaines, and al other Officers. He ought in the beginning to receyue from the Generall the true number both of Horsemen and Footemen within the Campe or Armie, and by perfit computation to make a booke howe muche is due euery moneth to euery Colonel, Captaine, and other Officer, as well for themselves as theyr Bandes.

He ought to make his Proportion of paye wel knowen to the General, whereby the Generall mighte accordinglye make prouision that money be not wating to pay the Souldiours.

He oughte to conferre with the Maister of the Victuals to see how he is furnished, and accordinglye to disburse vnto hym, that hee bee not destitute of conueniente prouision.

He ought in like sorte to make allowance (when neede

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shal

shall be ) to the Maister of the Ordinaunce , for supplying his store of Munitiō as he shall see cause , by reason of consuming of the olde, or any importante seruices to bee done.

He muste conferre with the Master maister, to see howe the Bandes be furnished, what Souldiours be slayne, when and how many, and how and when supplied: deliuering pay to euery Colonel or Captaine, accordingly, keeping the Warrantes or notes of their hands for his discharge.

He ought also at the pay day to conferre with the Maister of the Ordinaunce, to see whether he haue any Bills from the Captaines or Colonels, for any Pouder, or other Munitiō receyued, and to deduct so much in their wages.

Greatly maye this Officer be ayded by Arithmetike, without the which it shal be an extreame toyle to make true computation of such variety of Payments , or before hande to Preconiecture of all sortes of prouision and Munitiō what shall be necessarie. But by ayde of that Arte the most difficult doubtēs that can therein arise shal with facilitie be resolved and dispatched.

This Officer ought also to be a man of greate Wisedome and wel experienced in Millitare Affayres, bycause he is vsed in Counsel where he is to speake his Opinion in al exploits of importaunce although they concerne not directly his Office.

This Officer the *Romaines* also had, named among them *Quaestor*, he had the charge of the publique Trefure, & was of the like reputation and account in al respects to this Officer of ours.

The

## The maister of the victuals.

**T**He Maister of y<sup>e</sup> Victuals seemeth to be an Office altogether dependent on the Treasurer, hauing nothing else to doe but to provide and take charge of the Provision in the Campe. And as cozne or other victuals shal grow scant, to make the Treasurer priue, that order may be taken for further supply either by money or sending forth the Forrage maister to take it by force, and against the pay day he must bring in his booke of accountes to the sayde Treasurer, and there receiue allowance accordingly.

## Of the Muster Maister.

**T**He Muster Maister also maye be accounted an Officer as it were dependent on the Treasurer, for that hys dutie is nothing else but by often renewing of the Bands, to see how euery Captaines Band is furnished, noting the Defaults from time to time, and the Supplies, and thereof to make a perfit booke, exhibiting the same at the pay day to the Treasurer, that allowance may be made to the Colonels & Captaines accordingly.

**H**ere I had thought to haue adioyned certayne Tables, of the allowance for the Leauie and entertaynment of Souldiours with their Officers, according to the *Almane*, *Spanishe*, *French*, and *Italian* customes, as well for *Cauallerie*, as *Fanterie*: But by conference I finde it so vncertain, altering from tyme to time, not only at the pleasure of the *Prince* that payeth, but also of the *Souldiours* that serue if they bee *Mercenarie*, that no certaintie



certaintie can therein be wel set downe. And very difficult it would be to determine any, that should not offend eyther the *Souldiour* that serueth, or the *Prince* that payeth.

The Paye also altereth, according to the *Conditions* of Entertaynment, for if the *Souldiour* bee allowed to Forrage *Gratis*, vpon the Countrie, as in these late Flemish wars *Duke Cassimers* companies, & al other *Ruyters* did, then may their pay be the lesse.

But if there bee a *Forrage Maister* that forrageth to to the vse of the *Prince*, and serueth the *Souldiours* by a price, then must their pay be the greater, accordingly as the *Prince* meaneth to prize his *Forrage*. &c.

These circumstaunces considered the *General* assembling his Counsell, may soone determine of the Rates & Payes to euery degree conuenient, which for diuerse respectes I thought not meete herevnto to be adioyned.



## Of the General. Chap. 15.



General ought first in his owne person so to refozme all disordered appetites, that his life maye serue as a mirrour to the whole Armie howe to refozme themselves : for *Qualis Rex talis Grex*, And such Example in the heade shal much moze effectually work refozation in the whole bodye of the Soldiarie, then terroz of Lawes, Neyther is there anye one thing that shal moze traine Nations to his obedience, than the Fame of his Vertues and good life.

About all things let him loue and feare God, and cause true Christian Religion in his Armie to be had in due reuerence, in such sorte that his Souldiours may perceyue he is indeede Religious. And let him by al meanes cause the Ministers of Gods word in his Armie to retayn their dignitie, and to be esteemed and reuerenced of his Souldiours. For if the very Paynims by due obseruation of their fayned Religion did kepe their Armies in maruellous obedience and order, how muche moze shal true Religion deliuered from the Almightye Lorde of Hostes auayle a General and Armie that loueth him to the atchieuing of myraculous Victories.

He ought to be Modest, and Temperate, not giuen to Riote or excesse, neyther miserable bent to filthye Lucre: But preferre his honour, before all worldly substance: No vain Vaunter, neyther to vendicate wholye to himselfe the prayse of god successe, but to impute the same firste to God, secondly to his Captaines and Souldiours that serue vnder him. And this Modestie, and Temperaunce, shal not only make his honourable Actions shine the moze gloriouslye, but also wonderfullie combine with hartly good wyll his Souldiours to loue and honoꝝ him.

S.

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He ought to be a man of great Patience and Constancie, in tolleration of labour and Misaduenturs, nether dismayde with ill successe nor puffed vpp w<sup>th</sup> the contrarie, but heedefully to lay hold on al occasions, and carefully to prosecute the good successe, and prevent the contrarie, that neyther in Miseric he be founde Abiecte, nor in victorie Insolent.

Briefely, he must be Religious, Temperate, Sober, Wise, Valiaunte, Liberal, Curtous, Eloquent, of good Fame and Reputation: learned in Histories, and in those Sciences and Artes that may enable him of himselfe, without directions from others, readily to conceyue and iudge of Militaire Actions of all sortes, wherein the Sciences Mathematical of all other for this honourable person are mosse requisite to be embraced.

A nobleman or Gentleman trayned vp in these Sciences, and inducd with these vertues, shall farre sooner attayne to that perfection which in a General is needefull, than a person vnlearned. And most Barbarous is the opinion of such as suppose Letters and Armes can not wel stande togither. For infinite are the Examples where Letters and Armes haue ioyned togither, even in the most famous and worthy persons of the world.

Was not Alexander the great trayned vpp in Philosophie vnder Aristotle, and hadde the Illiades of Homer in suche veneration, that he neuer trauelled or rested without them.

Hannibal also that famous Enimy of the Romaine Empire, was trayned in the Greeke, the only learned language of that time, and lefte at his death a Booke of his owne making in the Greeke tongue. And when he prepared to invade *Italy*, of purpose procured a learned *Grecian* to Leade, Enioe, & Discipline his Armie, by whose lerned Counsels he vanquished so many famous Romaine Consuls.

Alcibiades



Alcibiades a man of marvellous Prowesse among the *Grecians*, and so rare a Souldioure that Victorie did alwayes followe him what parte soeuer he did take, either w<sup>th</sup> hys Countrey or agaynst it, was also trayned v<sup>pp</sup>e in learnyng vnder that graue Philosopher *Socrates*.

*Scipio Africanus* the final Restorer of the Romaine libertie, and subuerter of the Carthaginians, who gaue the notable ouerthrowe to that famous Hannibal, was likewise Learned, and did no lesse esteeme of Xenophons booke of Cyrus, than the great Alexander of Homers *Iliades*.

*Iulius Caesar* the firste founder of the Romaine Empire, and one of the moste renoumed Souldiours that euer the Earth bare, was also singularly Learned, as appeareth by his conference with the Egyptian Philosophers aboute the Theoricke of the Sunne, and rectifying of the ycarely Reuolution, wherein, as among Souldiours for his Prowesse, so among Mathematicians for his Science he is registred, and to this daye those Solare Reuolutions or reformed ycares doe beare his name, and are among the Astronomers called *Anni Iuliani*. But if no other Testimonie of hys learnyng remayned, his owne Commentaries sufficientl<sup>y</sup>e argue howe learned a man he was, whiche worke perhappes hath made hym no lesse famous, than al other hys honorable Actions.

I omit *Epaminondas*, *Agessilaus*, *Fabius Maximus*, *Augustus Caesar*, *Themistocles*, and *Silla*, all famous Generals, and men excellently Learned. For infinite are the Examples, I mighte alleage to proue this Argument, but in a matter manifest it were vaine to produce more witnesses. And this by experience I finde, <sup>y</sup> it is only the grosse, ignorant, and ruder sort that hold this Opinion: For the most Famous Souldiours this daye in *Christendome* I know are of

*S. J.*

another.

another minde, and doe chiesely esteeme of learning and of learned men.

And God sparing life I doubt not to make it apparaunte to my Countrey men, as well in the Art of Fortification, as manedging of greate Artilerie, and sundry other principall poyntes of Souldiourie, that the Sciences Mathematical are most necessarie, and may not be missed in such a Noble mā or Gentleman, as will aspire in dede to the perfection of Souldiourie.

Experience also in a General for the learning of manye particularities is a thing very requisite: And yet in respect of that whiche by Letters also, I mean Histories, and Sciences, may be attayned, there is no comparison. *Multo enim latius circumspicit Metis quam Corporis oculus.* And in one yere may a man by reading knowe more sundry sortes of Embattayling, Encamping, and Fortifying, more Stratagems and Policies by famous Generals put in execution, more good Ordinaunces, Lawes, and Discipline for keeping Souldiers in Order and Obedience, more rare deuises of Engins, Mynes, and like Militaire Inuentions, than is possible for him to see in an hundred yeares Experience. And more perfection for Militaire gouernement shal an Alexander, an Hanibal, a Scipio, or a Caesar, trayned in learning, in two yeares Experience attayne, than some ignoraunt vnlearned person in twentie.

Hereof it commeth to passe that some one albeit he be a person of bodie strong, lustie, and couragious, hauing bene twentie yeares in the Warres, shall haue little more in him than to discharge the durtie of a Private Souldiour. And some other shall be by Nature of that Spirite and lyfe, and by learning of that Capacitie and Dextérité, that wyth a fewe yeares Experience shal be worthy to be a Councellour to euery famous Generall. *But Dignior est qui pollet viroq.*

And



And therefore an honourable person, meaning to become a perfitte Souldiour, after he hath by Science enriched his mind and vnderstanding, to satisfie also common Opinion, I would haue him by vse, practise, and experience, enfourme his senses, and enable his bodie. And this caused the Antiquitie to portray the Statues of their Emperoures with a Booke in one hand, and a Sword in the other.

*Emperours portrayed with a Booke in one hand, and a Sword in the other.*

If Kings and Princes in this sort, for knowledge, Vertue, & Valure, would make choyse of their Generals, they should not neede to restreyn them within so narrow boundes by their Commissions, but leave the manedging of the warres with more libertie to their Discretion, who fronting the Enemie, and being alwayes in the field present, shall euer more be able to make farre better Resolutions, than the graneest Senate, or Counsell of the worlde absent, especially in these Militare seruices, where many times Suddaine Resolutions are required, and no time for Deliberation admitted, seeing such Occasions suddaynely maye be offered, as if presently they be not accepted and pursued, in bayne afterward shall they be expected.

First therefore, before the Generall receyue his Patent, it shall be requisite for him to vse the Counsell and aduise of certayne choyse men, with whome he may conferre of all circumstances concerning the Seruice, wherein he shall be employed, and so accordinglye make meanes to haue his Commission framed or amplified, and especially to regarde that he haue as well allowance to rewarde the Vertuous and Valiant, as Authoritie to punish the vitiuous and cowardly persons. For that Generall that is ready to correct the Offender, and not rewarde the wel deseruer, dischargeth but the moytie of his Office.

Also, that immediately vpon the receypte of his Letters Patents, he haue due regard, that al his Officers, Colonels, and Captaynes, be men able to discharge their place & calling of themselves, and not suche as sometimes are chosen



by Fauour without Vertue, who being assigned to directe others, had more neede to seeke some other to directe themselves. For heerein chiefly consisteth the Valour and Wisedome of the Generall, to be able by conference to make due examination of mens habilities, and according to their Capacitie and Vertue, to committe charge vnto them: for that Generall that iudgeth onely by apparance and report, shall be extreamely abused, seeing it falleth often out, that men of great Fame by due triall are found of small sufficiencie.

It is, also the Office of the Generall, not onely to see that his Coronels, and chiefe Officers haue their Pay and Furniture, but also that they impart the same duellie with theyr Souldiours. And if one quarter of the pay were committed to the custodie of their Ensignebearers, neuer to be answered the Souldyers till the ende of the Warres, it would worke many good effects.

The Generall ought not only to see good choyse made of the Marshall, the Lieutenant of the Horsemen, the Treasurer, the Payster of the Ordinance, the Sericant Generall, the Scoutemayster, the Payster of y<sup>e</sup> Carriadges, of the Victualers, Miners, and Pioners, &c. but also to reuiew the election of euerie of his Captaynes and their Officers, to allow or alter as he shall see cause.

Also, if there happen to be vnder his charge more Nations than one, it shall be requisite (to auoyd Enuie and contention) that he elect certayne choyse men of euery Nation, to be of his Counsell, with whome he should debate of euerie Enterprise, & heare their Opiniōs at large, but his Resolution should be so secret, as none or verie fewe should be made partakers thereof, befoze the execution.

The place of Assemblie where the Armie should first Muster, should be appoynted in some holesome seate of some fertile Countrey, that at the beginning the Souldyours be not discouraged neyther by Sicknesse nor Pe-  
nurie.

nurie.

Heere ought also the Generall to see and examine euery Officer, whether they haue a sufficient Proportion of Armour, Weapon, Shot, Powder, Artillerie, Boates to make Bridges to passe Riuers, Spades, and Mattocks, and euery other particularitie, befoze they once begin to march forward.

Heere ought also the Generall to assemble his Counsell, and to ordeyne Statutes and Lawes for the gouernement of his Souldiaries, first communicating the same with his Coronels and Captaynes, causing them also to imparte them to their Bandes, suffering euery man franckly with due reuerence, to speake, object, and by writing if they list, to offer vnto any of the Counsell what they can againste anye of them, which Obiections considered, they shal resolute vpon those Lawes and Penalties, and then cause euery Coronell and Captaine to take his Oth, and they likewise to cause euery Souldioure at the Ensigne to take their othes, to obserue, and as mutche as in them shall lie, to cause to be obserued euery of these Lawes and Edicts so agreed on. Thys done, the Armie maye beginne to march, whensoever the Generall seeth occasion.

The Generall is by good, especial, and perfitte Plattes, Mappes, and Models, to know the Scituation, Nature, and propertie of the Countrey, and his parts, where he is to passe with his Armie, whether it be playne and Champion, or wooddie, and full of waters, furnished wth strong Townes, or contrarie, accordingly to proportion the Horsemen and Footemen of his Armie: for if it be moste parte Champion, and full of Forradge, it is meete to haue the more Horsemen, if contrariwise, it standeth vpon straytes, and Fortified places, he is to haue the more Footemen.

Light Horsemen are in all places for Discouerie, fetching in of Booties, and pursuing of Victorie, verie seruiceable, and by no meanes to be spared.

The

The Generall ought also by good especiall to learne how his Enimie is appoynted : for againste the Frenche, who are bound with Shotte, and haue fewe Pikes, the Launce and light Horsemans staffe of the North is singular good, and especially in the playne : But againste the Switzers and Lance-kneyghtes the Launce auaieth little, but the Pistolers and Argoletiers shall muche more annoy them.

I like well to haue some Carriages allowed in pay, to attende on euerie Bande of Footemen, as well as on the Horsemen, who besydes the Carriage of necessities for the Souldyers vse, maye also in tyme of Skirmishe, and other encounters, serue to carrie hurte men out of the fielde.

The Generall maye allow euerie Coronell, Captayne, and principall Officers in the fielde, certayne Gentlemen extraordinarie, whiche shall be selecte persons, able to discharge euerie Office vnder them, and also to supplie theyr places in euerie suddayne, and for suche to haue good paye and allowance, but for Dead payes I hold them not conueniente.

The Generall ought also not onely to haue expert Enginiers, and menne of excellent knowledge in the arte of Fortification both of Fortes and Campes, conducting of Mines, planting of Batteries, &c. but also to haue therein himselfe requisite knowledge, otherwise shal he be misledde by fantastickall deuises of suche as profite and vaunte themselves of the knowledge they are nothyng giltye, and purchase hymselfe perpetuall Dishonoure. And howe muche suche a Generall shall surmounte other, maye appeare by the Prince of Orange, who by reason of his owne excellent knowledge in Fortification, hath himselfe bin the chiefe or onely Enginer to make so many inuincible Cities and Townes, as in Holland, Zeland, Brabant, and Flaunders are at this day to be sene : And thereby onely or chiefly of any humane cause, hath bene able to  
make

*The Arte of Fortification, a Study for a Generall.*

*The Prince of Orange.*



make hed againſt the moſt famous Souldiours, and Generals of Chriſtendome: And reduced the Country from moſt abundant Fortune to the ſtate we may preſently ſee, contrary to all expectation.

A Generall ought to haue good conſideration of the place where he meaneth to Encamp and continue, that it be not in an vnwholeſome and infectious aire, but that his Souldiours may lie on drie ground, and yet not farre diſtant from Wood and Water, the which are ſo neceſſarie as in a Campe maye not be ſpared: And if he perceiue Sickneſſe in his Căpe to increaſe, the beſte Remedy is often to remoue, and to encamp vpon Hills and dry grounds, and to giue ſtraite order that al garbage of Beaſtes and other filth be enterred, & the Camp preſerued as ſwete as poſſible maye be.

He is to giue order that his Souldiours be kepte in Exerciſe, eyther in marching and trayning, or in ſome kinde of Militaire Labour, which ſhal not only enable their bodies in ſtrength and agilitie, but alſo preſerue them in Health.

He ſhoulde while faire weather is, acquainte his Souldiours to reſte and ſleepe on bare ground: And though the Enimie be farre abſente, yet duely to maintaine their Scoutes to Watche and Warde, and perſorme all other Militaire orders no leſſe curiouſly than if the Enimie were ſtill preſent, whereby it ſhall not ſeeme grieuous when neceſſitie ſhal requyre it.

He is alſo befoze he Encamp to conſider, if he haue abundance of Horſe, that there be good ſtoze of Forradge nigh the Campe, otherwiſe, in ſozraging farre off, he may greatly hazard his Companies, if good Conueys be not ſent with his Forragers, and their iourneys diſcreetly directed.

Good regarde muſte alſo be had, that the Campe be not ſubiet to any Hil, from whence the Enimie may beate with great Artillerie, nor ſo diſloyned from Water, that the Enimie may eaſily cut you from it, neither yet ſo lowe as the Enimie by cutting the bankes of any Riuer may drowne the

L.

Camp.

Campe.

If there be no great Riuers, but onely small Fountaines or Welles to water your Armie, then muste good Watch be kept, that they be not by the Enimie poysoned and infected.

The Generall shoulde not so muche seeke to place his Campe in seates strong by Nature, as to Fortifie them by Arte, aswell to keepe his Shoulders in Action, and from ydenesse, (the only ruine of Armies) as also that due order in Campes may be maintayned: And therefore let him imitate the auntient Romanes, the very Masters of the Art of War, who neuer coueted other than the Plaine to encampe vpon: Entrenching themselves nightly in no lesse strong and sure maner, than if the Enimie had encamped by them, and that euen in places vtterly boide of all suspicion, to make these Militaire Trauelles familiar to them, and to auoide those idle, or rather dissolute Effeminate Pastimes that oure Christian Campes are bewitched with all, to the vtter ruine of all good Militaire Discipline, and confusion of oure Armies.

Metellus in  
Affrike.

The Generall oughte for auoyding of Mutinies and all disorders within his Campe, to haue his Statutes and Lawes openly Proclaymed and set by publihely for euery man to reade, with the paine to euery offence assigned, and the same seuerely to be put in execution on all offenders without any respect of Persons.

In a running or moueable Campe the readiest Fortification is to impale it rounde with the Carriages chayned together, bending the Artillerie that waye where moste suspicion is the Enimie shall approche, and if tyme will permitte to caste some Trenches also wythoute the Carriages.

Duke of Alba.

This Pollicie vsed the Duke of *Alba* in the late Flemish Warres, against the Prince of *Orange*, who inuading wyth a greate power of Horse, and finding the Duke of *Alba* almoste

moste all Footemen impaled w<sup>th</sup> Carriages, was neuer able to gyue him Battayle : And in the ende for wante of Forrage and Victualles was driuen to retyre.

He shoulde see his Souldiours kepte in continuall Militaire Exercise, and by fained Alarmes to see in what readinesse his Bandes woulde be if necessitie requyred: To thew them all manner wayes howe the Enemie maye attempte them discouering also to them the remedye, and howe they are to aunswere those Attempts: For no manne is borne a Souldiour, but by Exercise and Trayning it is attayned: and by discontinuance againe it is lost, as all other Artes and Sciences: Neyther is there anye Nation for Militaire Actions so Honourable, as by Reste and Discontinuaunce will not growe Effeminate and Reproachfull: For anye Nation by nature so abject and base, that by a worthy Generall with Trayning will not produce good Souldiarie: As by infinite examples of Antiquitie maye bee approued. And in these dayes wee haue seene the Flemings, a people by reason of theyr Reste, Riches, and Delicate Life, contemned, and no valure for Armes supposed in them: Yet since the Prince of Orange hath put weapon into their hands, and trayned them, they haue not onely defended themselves, but also in sundry exploites giuen the famous Spaniardes greate voyles: Suche is the baloe of a grate wise General, as is able to chaunge the Nature and Fortune of an whole Nation *Annunte Deo.*

In setting of a Camp, besides the commodities of Wood, Water, and Forrage, the Generall muste also consider how Victualles may safely come vnto him: And to leaue no Castelles at his backe to annoy them, but that hee seeke to possesse them befoze he marche forwarde: For greate is the annoyauce that a little Pile at the backe of an Armie may do, aswel against Forragers and Straglers, as to cutte off Victuallers from the Campe.

The Generall is also by god Platted to consider the  
L.ij. Scituation



Scituation of the Countrey, howe, bothe the Friend and Enimie Townes lye from his Campe, the Hilles and Valleys, Ways, Straits, and Passages, Lakes, Riuers, and Bridges, their number, quantitie, distance, and euerie particularitie, which maye be done by conference with his Guydes, and other persons that knowe the Countrey, conferring their assertions with his Plattes: And so to consider, whether the Enimie maye conueniently sende out to cutte off his Victuallers, or by Ambush annoy him in his Marche, and for preuention thereof to sende abroade both Light Horsemen and Harquebuziers to garde the straites and passages, towards the Enimies Garnisons. Wherein is Iulius Cæsar singularly extolled by Suetonius Tranquillus to surmount all other for choosing his grounde to Marche, Encampe, and Fight vpon: Wherein by the singular knowledge he had, bothe in Geographie and Astronomie, he woulde prudently forecasse all annoyances of Sunne, Winde, and Weather: The nature and Scituation of the Countrey, of Riuers, Hilles, Valleys, Wooddes, Straits, and such like, by Geographicall Cartes and Mappes exactly made. And hereby also hath the Prince of Orenge in these late Flemish warres greatly aided himselfe: For hauing of Hollande, Zelande, and all other partes of the lowe Countries verie perfite and exquisite Mappes & Plattes, he was able at one time in sundrie partes to giue Direction whiche Straits shoulde be garded, what places Fortified, whiche Leuels might be Drowned either by Sea, or fresh waters. And thereby often auoided present and impendent perilles, and contrarie to all expectation, hath rowed out the Spanishe Enimie of so manie strong Fortes and Townes by them possessed.

Before the Armie discampe, all Passages and Wayes for the Souldiors and Artillerie &c. to passe, should be discovered, and skilfull men appointed to leade them, which of the Romanes were named *Campiductores*.

He ought not to suffer any Band to marche scattered, but

Iulius Cæsar.

The Prince of  
Orenge.

Geographie for a  
Souldior requisite.

but in order of Battell, or at leaste if Straites and narrowe Passages inforce to draw them forth in Herdes, and presently so soone as place serueth to reduce them againe into order of Battell: And this is to be vsed as wel in places of Securitie, for Exercise and Reputation, as in places of Suspecte for safetie and Defence.

He oughte to haue wpth him good Guides that perfittely knowe all particular Passages, Hilles, Valleys, Woodes, Riuer, &c. for of the Countrey in generalitie the Generall himselfe ought perfittely to be informed by Plattes and Modelles, whereby also he shall the moze readily conceiue any information that shall be brought him by espiall.

If the Generall haue sundrie Nations vnder his gouernement, it is not meete to giue allwayes to anye one Nation the Vaward, considering (the same being in marching towards the enimie the place of greatest honour) the others wil much repine against it, and not without good cause. The order therefore of Marching shoulde in such sort be framed, that euery Nation shoulde haue his turne withoute partiall fauoure to any one. And if the number be great of anye one Mercinarie Nation, it is not amisse to deuide them bothe in Marching and Imbatteling for sundrye respectes, whiche in this place I omitte to declare.

*Observed by  
Count Bossute,  
and Monsieur  
Lanoy in their  
Ordinances, 1578.  
in Brabant.*

If any Straite be kepte by the Enimie, it is not meete first to charge the vpon the very Front, but to send Light Horsemen and Shotte to skirmishe with them on either Flanke, and then wpth Targets of Pwse to enter vpon them.

The Generall shoulde before he bring hys Souldiours to deale with the Enimie, first in some plaine and Champion place cause them to be ranged in forme of Battell, making of his Footemen sundry Battallions: And of these Battallions sundry Frontes, to deuide hys Horsemen also into sundrye Troupes, placing the men at Armes, Dimilaunces, Lighte Horsemen, and Argoletiers euery sort in seuerall Troupes by themselves, to cause the Forelorne Hope to issue oute

*Pastimes for a  
Generall.*

*L.ij.*

and



*Troall of trayned  
Souldiors.*

and skirmish them befoze the Battallions, as if the Enimie were indeede present, and vpon a Signe giuen, sodainely to retire. The Horsmen to charge and retorne againe to their place, vpon their retire to cause certaine fléues of Pikes, and light armed, to runne out to their Rescue, as though the Enimie did pursue them. Then the Battallions of the firste Fronte to marche sozwarde, and bende their Pikes, and sodainely after sounde of the Retreite, to retire themselves orderly betwéne the Battallions of the second Front: Then that seconde Front to march sozward and bend their Pikes, and the other that firste retyzed to make hed againe vppon the Enimie: Last of all, the Light Horsmen, and Light Armed Footemen againe to breake forth as it were to doe execution vpon the Enimie Flying.

These thinges, if in pastime they be able readily and orderly to performe, there is good hope they will honozably put it in execution vpon the Enimie: Otherwise to bring them without this former Trayning to deale with the Enimie, is nothing else but to leade them to the Butcherie.

*What Natures  
prone Souldiors.*

It is aboue all other thinges soz a Generall requisite by al meanes to animate his Souldiors to Frugalitie in expences, and Tolleration of Labour: For it is not the wilde, rathe, fantastickall heade, but the sober obedient minde, and the harde painfull bodie that maketh the Noble Souldior. And nothing moze continueth the Bodie in Health and Stréngth than Exercise. Sundry sortes therefore of Militaire Actiuities an Traynings the Generall shoulde deuise, and enioyne his Coronelles and Captaines to képe their Souldiours in continuall Actions, soz the Body of man is in qualitie like yron.

*Pulchrius est usu cessans, rubigine sordet.*

Let the Generall consider the nature of the Enimie, Nations with whom he dealeth: If they be of Delicate Bodies, not hardned in War: Or if he perceiue that Vactualles sayle them,



them, Or that sicknesse encrease among them : Let hym in any wise abstaine from Battell , for more assuredlye shall hee that waye preuaile. And as honourable doe I iudge the Victorie to the Generall, by that Pollicie attayned, as if by the bloude of his Souldiours he shoulde atchieue it.

There is nothing more perillous in giuing Battell, than to laye befoze the Souldiours eyes any place of Refuge to fly vnto: But rather should the Generall declare vnto them, that there is no hope to escape, but onely by Victorie, and herein to imitate the proceeding of Hanniball againste the Romanes.

There is nothing more Barbarous than in giuing Battell to committe all to the hazarde of one Fortune or Encounter, but in suche sorte to deuide the Regiments, that if one be defeated, there maye remaine others in order to charge vpon the Enemie, who following Victorie with disorder, as commonly it is seene : If they were but the thirde parte of theyr enimies number, yet may they recouer the field againe. And in this to imitate the Romane Discipline, who euer so ranged their Armies, that Fortune muste at the leaste thrice abandon them, and fauour thrice their aduersaries, or else they coulde not be vanquished.

There is nothing more perillous than to giue the Enemie Battell in suche place where he hath no Refuge or Possibilitie to escape, for that Necessitie maketh men Desperate, it uniteth them togither : And it hath often bene seene, that verie small companies by such like occasions being reduced to Desperation, thereupon resoluing to sell their liues deere, haue contrary to all expectation attayned Victorie vpon their Enimies in number farre greater.

Coronelles, Captaines, and suche principall persons oughte not to bee thruste in Rancke as Priuate Souldiours,

*In this case did  
6000. Englishe  
defeat 60000.  
French at Poitiers*

Truill of trayned  
Souldiors.

and skirmish them befoze the Battallions, as if the Enimie were indeede present, and vpon a Signe giuen, sodainely to retire. The Horsmen to charge and retorne againe to their place, vpon their retire to cause certaine fléues of Pikes, and light armed, to runne out to their Rescue, as though the Enimie did pursue them. When the Battallions of the firste Fronte to marche foꝝwarde, and bende their Pikes, and sodainely after sounde of the Retreite, to retire themselves orderly betwéne the Battallions of the second Front: Then that seconde Front to march foꝝward and bend their Pikes, and the other that firste retyzed to make hed againe vpon the Enimie. Last of all, the Light Horsmen, and Light Armed Footemen againe to breake smyth as it were to doe execution vpon the Enimie Flying.

These thinges, if in pastime they be able readily and orderly to perfoꝝme, there is good hope they will honozablye put it in execution vpon the Enimie: Otherwise to bring them without this foꝝmer Trayning to deale with the Enimie, is nothing else but to leade them to the Butcherie.

That Natures  
roue Souldiors.

It is aboue all other thinges foꝝ a Generall requisite by al meanes to animate his Souldiors to Frugalitie in expences, and Tolleration of Labour: Foꝝ it is not the wilde, rashe, fantastickall heade, but the sober obedient minde, and the harde painfull bodie that maketh the Noble Souldior. And nothing moze continueth the Bodie in Health and Stréngth than Exercise. Sundry suytes therefore of Militaire Actiuities an Traynings the Generall shoulde deuise, and enioyne his Coronelles and Captaines to képe their Souldiours in continuall Actions, foꝝ the Body of man is in qualitie like yron.

*Pulchrius est usu cessans, rubigine sordet.*

Let the Generall consider the nature of the Enimie, Nations with whom he dealeth: If they be of Delicate Bodies; not hardned in War: Or if he perceiue that Váctualles sayle them,

them, Or that sicknesse encrease among them: Let hym in any wise abstaine from Battell, for more assuredlye shall hee that waye preuaile. And as honourable doe I iudge the Victorie to the Generall, by that Pollicie attayned, as if by the bloude of his Souldiours he should atchieue it.

There is nothing more perillous in giuing Battell, than to laye before the Souldiours eyes any place of Refuge to fly vnto: But rather should the Generall declare vnto them, that there is no hope to escape, but onely by Victorie, and herein to imitate the proceeding of Hanniball againste the Romanes.

There is nothing more Barbarous than in giuing Battell to committe all to the hazarde of one Fortune or Encounter, but in suche sorte to deuide the Regiments, that if one be defeated, there maye remayne others in order to charge vpon the Enemie, who following Victorie with disorder, as commonly it is seene: If they were but the thirde parte of the enemies number, yet may they recover the field againe. And in this to imitate the Romane Discipline, who euer so ranged their Armies, that Fortune muste at the leaste thrice abandon them, and fauour thrice their aduersaries, or else they could not be vanquished.

There is nothing more perillous than to giue the Enemie Battell in suche place where he hath no Refuge or Possibilitie to escape, for that Necessitie maketh men Desperate, it vniteth them together: And it hath often bene seene, that verie small companies by such like occasions being reduced to Desperation, thereupon resoluing to sell their liues deere, haue contrary to all expectation attayned Victorie vpon their Enimies in number farre greater.

*In this case did  
6000. Englishe  
defeat 60000.  
French at Poitiers*

Coronelles, Captaines, and suche principall persons oughte not to bee thruste in rancke as Priuate Souldiours,



ours, but being at libertie, muche moze oughte they by Hed and Tongue to direct, than with Hande to execute, albeit sometimes in cases of Extremitie they are to execute with the Hande also, but in day of Battell to put al the p<sup>r</sup>incipall Officers into the first Rankes, where they can doe no moze than Priuat Souldiors, it is Barbarous, and by an Honorable wise Generall by no meanes to be permitted.

Footemen lightly armed, bothe Pikes and short weapon, as Swordes and Targettes to mixe with Shot, are of great service. Uery famous Generalles, finding themselves ouer matched by Horse (their Enimie in Cauallarie far surmounting them) haue in the day of Battaile giuen order, that certaine Troupes of these light armed shoulde assist their own Horsemen : and after the Charge was by them receiued, these Light Armed shoulde with a Cry in great furie bzeake vpon the Enimies Troupes of Horse : And haue by that meane not onely rescued their owne, but also so broken and chased the enimie Cauallarie, that contrary to all expectation, thereby onely they haue defeated them, and wonne the fielde : A Pollicie to be reuiued where the Generall shal find himselfe in Cauallarie too weake.

These light armed Footmen shoulde be trained of purpose to fight among Horsemen, to followe the Enimie in Chace, and yet vpon any sodaine to vnite themselves againe in one Bodie, to abide a Charge, and sodainly againe to bzeake and followe the Chace, and oftentimes to reiterate the same ; to put the like in execution againste the Enimie when occasion is offered, whiche by Practise right well will be attayned, howe strange soeuer nowe for wante of vse in these dayes it may seeme vnto vs.

The Romanes vsed a kinde of Forelorne Hope or Skirmishers called *Cursor*es or *Proclastas*, whiche they diuided into thre sortes, *Antistites*, *Cornistites* and *Tergistites*, neyther woulde they euer tourne out any of these to skirmishe, but that they were backed with Armed men, Pikes, Swordes, and

Cæsar against  
Pompey.

Scanderberg against  
the great  
Turke.

Reuiued by the  
Spaniards.

and Targets, or such like: And these they called *Vindices*, Reuengers or Rescuers: And this shoulde also euen in these dayes with our Shot be practised, as well to garde the from the Charge of Horse, as to aide them if they shoulde loyne pele mele with their Enemies: As the Spaniards haue of late dayes begonne to practise.

Skirmishes shoulde neuer rashly be made nor bled at any time, but to some ende and purpose, as to Discouer, or win Skirmishes to what ende. some grounde of Aduantage, or some Straite, or befoze the Battell to giue Souldiours Courage, by giuing the Enimie some Foile: but the leading of such a Skirmishe, oughte to be committed to some sober, wise, discrete, valiaunt Gentleman, who either by laying secrete Ambushes and Receites, or by some other Train and Pollicie may be assured to giue the Enimie some Foile. For that kinde of fleshing the Souldiours befoze the Battell, is a matter of greate importance, not onely to them that were present at the Skirmishe, but also to the whole Armie, who by their example wil take Courage and Boldnesse. And as a Generall ought by al meanes to seeke this aduantage, so oughte he to be as warie that his Enimie get not the like vpon him, and to preuent the same, must giue commaundement, that no man vpon pain of Death be so hardie as to enter in Skirmish wyth the Enimie, without expresse commaundement from hym selfe or some of his principall Officers.

As a Generall ought neuer giue battayle to his Enimie, wythout great and apparant reason either of Aduantage or Necessitie, so is he chiefly to abstaine if he perceiue hys Souldiours to haue conceined any secrete feare. And herein greatly auaieth the wisdom of the General, to discern the nature and disposition of his Souldiours, and by comfortable and couragious wordes to animate them, and (as hath bin saide) by Skirmishes of aduantage to Fleshe them, and by continuall Trayning to make them knowe their strength and aduantage of their Orders and Discipline:

U.

And

Note Iulius Cas  
sar after his bat-  
tel at Durazzo.

And by no means to giue entire Battell, til he haue by some of these or like meanes banished all feare from them. For there is no Enemie sooner ouerthrowen, than he that will accept Battell whensoever it is offered, as by manye Presidents may playnely be approued.

If in the Winter time the Enemie present Battell early in the morning, our Generall by Skirmishes shoulde delay and prolong the time as long as he maye: and in the meane tyme cause all his Souldiours, especially the heauie armed, to feede and refresh themselves with meate & Drinke, and then bying them to deale with y<sup>e</sup> Enemie, whom if they find with colde and fasting weakened, there is greate likelihoode of good Successe. By this mean only was there one greate Army of the Romanes at y<sup>e</sup> riuer of Trebes viterly ouerthrowen, by reason their Generall being ouermuche desirous to giue Battell, brought forth his Armie to fight, not suffering them to stay the feeding and refreshing of themselves before hande.

It were conuenient to appointe certaine Carriages and men, of purpose to giue their attendance in euery skirmish and incounter, to carry away the hurt men to such place as Surgions may immediately repayre vnto them, whiche shal not only greatly incourage the Souldiour, but also cause the Skirmish to be the better maintained, when the Souldiours shal not neede to leaue the fildes to carry away their hurt men. These were called among the Romanes *Desporati*. And this among many other laudable Romane Orders haue the Spaniards at this day reuiued and put in practise, whereby also they conceale from their Enemie what losses in any Skirmish they haue receiued, a matter of no small importance.

Hannibal that famous Generall, woulde seldome or neuer giue Battell, but he had before hand inuented some Politic to giue terroz to his Enimies, by some sodain attempt of secrete Ambushments, either on their fläcke or Backe, accom

Reuiued by the  
Spaniards.



accommodating his deuice to the oportunitie of the time & place, which in his last Battel with Scipio he coulde not so wel do, by reason the place was plaine & Champion, where onely Magnanimitic and good Discipline mighte preuaile: wherein the Romanes being nothing inferiour, he had not that fortunate successe, which in many other battels he had against them. A worthy Generall therfore shoulde bozowe bothe of Hanniball his subtile Stratagemes: And of the Romanes their Warlike Orders and Discipline: And in execution of such Pollicies, Secrecie is aboue al other things to be respected: for as there is no Stratageme so excellēt, which being knowne the Enimie may not preuente, so is there almost no deuice so simple, & being secretly kept, and suddenly putte in execution, but it will worke singular good effects.

*Hannibal and  
Cesar Patternes  
for a Generall.*

To the Generall of the fielde it appertaineth, al the time of the Battel to giue order, when the skirmishers, or Forlorne Hope shall retire, and to what places: When the Horsemen shall charge, what Troupes either of Horsemen or light armed Footemen shal come to their Rescue: What Battallions shal marche forward, when they shall retire, when the light armed shall pursue the Victorie. For this and all other accidents that may happen during the time of Battell, the General ought attentiuely to giue order from time to time what shall be done: And that aswel by Messengers which shal alwayes attende vpon his person for that purpose, as by the soundes of the Trumpette and Drummes.

*The Generall  
in the day of  
Battayle.*

And albeit sundry be the Opiniōs of Souldiōrs touching the Place of the General in the day of Battel: Some would haue him mounted on Horsebacke, others on fote: Some in the hearte of some Squadron or Battallion neare the Ensigne or Standarde: Others at libertie not tyed to to any place certain. And for confirmatiō of euerie of these Opinions, the Examples of very worthy Generalles maye

*A. G.*

be

be alleaged. Yet briefly to set downe vpon consideration of sundry Discourses that I haue heard & read, what I thinke best, I say, I would not haue the General mounted on any principall Horse of Seruice, but vpon some Nag, (I meane such a General as is strong in footmen) neither to put himselfe into any Battallion or Squadron, but being accompanied with a reasonable strong Guard, and certaine very sufficient Gentlemen likewise mounted vpon Nags, to passe from place to place, from one Battallion to an other, during the time of Battel, prescribing continually what he would haue done, sending of these Gentlemen to deliuer his meaning and commaundementes to suche Officers as are to see them presently put in execution. And neuer to put himselfe into the bodie of any Battallion or Squadron, vnlesse he see the Enimie so preuaile, that his Skirmishers and light armed be beaten in, the Battallions of his former Frontes retired, and that the matter is reduced euen to the laste fight: Then may the General either dismount, & enter into some select Battallion to make the laste trial, or into some principall Squadron of Horse, to giue order for the retyre of his people, and safegard of his person, if he see no other remedy.

The Place and  
Duty of the General  
in the day  
of Battel.

If the Enimie haue newe aide, and supply of menne coming vnto him, then oughte the General to seeke al means to giue him battel, befoze both his powers toyne: Or if Victualles and Pay beginne to faile vs, or be likely to growe dayly moze scarce among vs, oure General shoulde neuer refuse Battel, if any oportunitie be offered: But otherwise, if our General expect farther supply, or if oure enemies Victuals faile them, or Sicknesse increase among the, let him stand strongly vpon his Guard, but by no means ioine battel with them so long as he can conueniently auoide it.

The Romanes  
against Hannibal  
and Asdrubal.

The Experiēce hereof was lately seene in these Flemish Warres. 1578. between the States and Don Iohn D' Austria, who vnderstanding of the coming of Duke Cassimere with 5000. Ruiters, and, 6000. Footemen, offered the Armie of  
the

Don Iohn and  
Counte Bossute at  
Rymenant.



the States battayle at *Rymenant*, where they laye encamped to expect Duke *Cassimers* comming. But Counte *Bossute* Generall of the States Armie, albeit bothe for footmen and Hozemen he was well able to haue foughte w<sup>th</sup> hym, yet gaue he straighte order, that none of hys armed should stirre out of the Trenches, but only the Shot, and certaine Hozse to garde Passages, and maintaine Skirmishe, so that Don Iohn finding his expectation deceiued, and that he coulde not traine them forth to the Battaille, was driuen to march away. And this Temperaunce in the Count *Bossute* was no lesse *Sodiarelike*, than the other courageous attempt of Don Iohn, both being done w<sup>th</sup> great reason.

If at any time, by reason the General perceiueth his aduersary ouer strong, he thinke good to march away to places of more strength, he shoulde so vse the matter, that hys Souldiours by no means vnderstande or suspecte it is done to auoide Battell, but rather to signifie vnto them his intention is to retyre, to the ende he may drawe the Enimie vpon his Ambushes, or into some grounde where he maye giue them Battell to his better Advantage, for otherwise the Retire may strike so great a Terrour into the heartes of his Souldiours, as hardly after will be remedged by anye perswasions.

If the Enimie vpon our retreite pursue vs, the Generall muste giue order to lay sundry Ambushments of Shotte to garde Straites and Passages, & also to leaue certain Troupes of light Hozse and others by skirmish to stay them, while y<sup>e</sup> heauie armed may marche awaye. But if the Enimie pursue vs so faste, that our armed Fanterie cannot march away in Militaire order, let the Generall prepare to giue them battel, and rather chouse to put it to that honourable triall, than in any iote to breake his Militaire orders, or by disordered March to strike a fear in y<sup>e</sup> hearts of his Souldiours.

Before the Battel, the Generall muste giue commaundemente vpon paine of Death, that no Victualler, or other

W.ij.

person



*Attilus a Roman  
Consul.  
Philip King of  
Macedony a  
gainste the Scythians.*

person whatsoeuer shal departe away, during the fight. And some famous Generallies haue appointed certayne Troupes of Horse of purpose to attend and do execution on any such as they shoulde perceiue to breake or offer to escape away.

*Hannibal against  
the Romanes in  
the Battayle of  
Cannas.  
Marus against  
the Cymris.*

It is no small aide in the day of Battell to get the Sunne, the Wind, and the higher ground of the Enimie, for these being on our side, and against our Enimie, they fighte for vs, and albeit they seeme matters of small importance, yet the wisest and valiauntest Captaines haue not a little respected them.

Some haue in the day of Battell caused certaine of their owne Bandes, to renolte to their Enimie, who afterwards haue bin no small cause of their Victorie. As Hanniball against the Romanes in the battell of *Cannas*.

*Muscleborough  
Fielde.*

Some in the time of Battell by corrupted espies or otherwise haue caused rumour to be spread in the Enimies Battell, that their Generall was slayne, or some part of them defeated, or flying awaye, and thereby so amazed them in the midst of the fight, that they haue swayed and broken. But thys muste be done on the contrarpe parte of the Battayle, where the Generall is not to bee scene.

*T. Quintus Capi.  
solinus.*

Some haue caused certaine of theyr owne Troupes euen vpon the first encounter to breake and runne awaye of purpose, to the ende the Enimie mighte followe the chace vpon them wyth disorder, and so fall into the bandes of the other Troupes standing orderly to receiue them.

*Julius Caesar in  
Fraunce.*

Some hauing enuironed their Enimies rounde aboute, and perceiuing that the same hath made them more desperately to fighte, and resolutely to stande to their Defence, haue of purpose opened and made a way for their Enimies to flye: And by that Pollicie onely haue had the chace and slaughter of them, that otherwisse woulde dearly haue solde

solde they lyues, or perhappes haue gotte the Victorie. As a small Troupe of oure Countrey men diode vppon the French in the like case at the Battell of Poytiers, where albeitt they were not a tenth part of their enimies number, yet being enuironed, hauing no place of Refuge, and therefoze resolved dearelye and honourably to sell their Liues, contrarpe to all expectation they hadde Victorie, and toke Iohn the French King Prisoner, with the slaughter of a greate multitude of his Nobilitie.

*Hannibal against the Germanes.*

Some seying they Ennemie desirous to passe a Riuier, to geue them Battayle, haue seemed for feare to marche awaye, leauing secrete Ambushes, and when they haue perceyued a good parte of the Armie past the Riuier, haue sodainely toured agayne, and defeated them befoze the residue were able to passe ouer to they res-  
cue.

*Labienus in Frisee*

Some abounding in Horsemen, to drawe their Ennemie into the Champion, haue offered Charges, and there vppon sayned a flyghte, thereby trayning the Ennemie into the Blayne, where they haue defeated hym, whome in Straites they were neuer able to encounter.

*King su inba As-  
sike against  
Curio.*

Some leaders of ffoemen haue also by sayning flyght, trayned their Ennemie Cauallarie into Straites, and there by secrete Ambushes sodainely sette on them, and defeated them, whome in the Champion they were not able to deale wythall.

*Thomiris Queene  
of Scythia against  
Cyrus, 200000  
horsemen.*

Some finding they Souldiours ouermuche desirous to fighte with the Ennemie, when it was not by due respects conuenient, and therevppon repining against the Generall for keeping them from Battell, to make them knowe their Error, hath of purpose suffered some parte in attempting some rashe enterpryse to be defeated of the Ennemie, and vppon that occasion made the reste vnderstand their faulte, and become the moze obedient to his commaundements.

*Fabius Maximus  
so vsed Minutius  
And  
Sertorius like-  
wise vsed hys  
mutinous souldi-  
oures.*

Some

Some haue of purpose abandoned their own Campe, as though they had fled for feare, leauing it full of wine and other Delicacies, and the night following, haue returned and set vpon those their enemies, who thinking themselves in Securitie, and drowned in those Delicacies, haue been rechelesse and vnprouided, and so by their Enemies when they leaste suspected, put to the Sworde and utterly defeated.

*attus  
ims* Some being pursued of their Enemy, euen to a Riuer, whiche they must either passe, or receiue Battell, haue settled down at the riuer side, entrenching themselves, setting vp some Tents, & sending abroad some Foragers as though they meant indeede to encampe. And their Enemies believing the same, haue likewise encamped and sente abroad their people to make prouision: In the meane time those so pursued, vsing this occasion of their Enemies negligence, and the aide of the night ensuing, haue sodainely passed the riuer before the Enemy coulde dislodge and drawe his people in order to giue them battell.

*Nabides against  
the Romanes,* Some being in like sorte pursued by a puissant Enemy, haue caste a Trench at their backe towards their Enemy, and filling the same with Woodde and other matter fitte to burne, haue set it on fyre, and so stayed the Furie of their Enemy till they haue passed ouer.

Some to passe a Riuer, otherwise not passable, haue lette it out by opening the Bankes into some lower ground, but the best is in an Armie Royal neuer to be without Boates of purpose, that chayned together, shall presently make a Bridge: Whereof in an other Treatise among other Militaire Engines I meane moze at large to speake.

Some being fronted by their Enemy on the contrary side of a Riuer, whereby they could not passe ouer to giue hym Battell without extreme disadvantage, after they had sundry dayes together marched along the Riuer, they that desired to passe, haue in the night out of euery Band drawn a certaine number of choise men, whome they haue sente secretly



cretely vnto the nexte ~~Woodes~~, with direction, that the nexte day after the Armies were departed they should come down to make and Fortifie their Bridge. The next day they haue both discamped, and their Enimie seeing the full wonted number of Bannes, Ensignes, &c. haue withoute mistruste of anye suche matter marched on, fronting their Enimie as befoze they were accustomed. But those that meant to passe, when they sawe time, haue sodainely returned backe again, and finding their bridge made, Fortified, & all things in readinesse, haue passed withoute any danger at all.

Some to passe a Riuer, though wadeable, yet verie violent and swift, haue caused their Horsemen, firste in two places to passe and crosse it, and then the Footemen to passe betwene those Troups of Horse: the one Troup breaketh the force of the water, & if any of the footmen happē to faile his footing, & be bozne away with the violence of the streame, yet the other Troupe of Horse may recover him.

*Pigius Rule.*

Some hauing sundry Partions in their Armie, haue ranged euery Partion separately into sundrie Battallions, and haue put in the forefront a Battallion of euery Partion, giuing it oute in the time of fight, that one Partion had Victorie, wherewith the reste inflamed shoulde likewise valiantly fighte: and by this Stratageme a wise Generall, shall greatly aide himselfe when he hath to commaunde sundry Partions.

*Monsieur Lautrek in the Kingdom of Naples.*

Some whē they haue perceyued theyr Enimies, by their laboꝝ and trauel, oꝝ hastie pursute, to be wearie, oꝝ by long standing in Battaille sainte, haue euen then vpon that occasion sodainely set on them, and defeated them, as oure Countrymen did the Frenche at the Battell of Cressie.

*Scipio against Asdrubal. Metellus against Sertorius in Spaine.*

Some finding themselves too weake in Horsemen, haue retyred themselves among Wines, Bushes and suche like breuen groundes. Others haue made secrete Trenches, couering them with hurdles, and Turffe: Others haue v-

*The Spaniards against the French at Cognola.*

The Englishe a-  
gainst the Frēch  
at Egincourt.

sed Caltrops and Stakes. By these and manye other meanes the ingenious Fanterie haue and euer will be Victorious against Cauallarie that rashly wil charge vpon them.

The Carthaginenses, who manye tymes hadde bene by Marcus Regulus ouerthrowen, at the last by the counsell of Zatippus the Lacedemonian they became Victorious: who aduised the to descend into the Plaines, where by their Elephants and multitude of Horse, they ouerthrew the Romanes.

Cornelius the  
Romane against  
the Samuites.

Cōst Carmignuola  
against the  
Syvitzers in  
Italy.

Some hauing with their Troupes of Launces sundrye times charged a Battallion of Pykes, and bene still repulled with losse, at laste haue caused all their Horsemen to Dismounte, and encountring on fote, haue defeated the Battell of Pykes, whiche on Horsebacke they could not by any meane breake or disorder.

Scipio against  
Asdrubal.

Castruccio a-  
gainst the Flo-  
rentines.

Some in the day of Battell perceiuing their Enimie to haue reduced his principal strength to some one part, haue not to the same opposed likewise their Strongest Battallions, but their weakest, giuing order, that when they came almoste readie to encounter, they shoulde retyre, and suffer the reste to deale, and by that Pollicie firste defeating the weaker, haue easily after dealte with the stronger, who being both inuironed of them, and also disordered, in pursuing those that of purpose haue retyred, were without any great difficultie afterwarde defeated.

Some haue drawne their Cauallarie, and light armed, behinde their Battallions of their heauie armed Souldiours, leauing betwene those Battallions sufficient space for the Horse to Charge, and Shotte to Play, by whiche Noueltie, happening so contrarie to common order, and their Enimies expectations, they haue attayned Victorie.

The Spaniards  
against Hamilear

Some haue broughte before the Front of their Enimies battell a number of Carriages drawen with Oxen, & laden with dry Woodde and other stufte fit to burne, and sodainely giuing fire vnto them, the Beastes to flye the flame at  
their



their tayles, haue violentlye runne forthward, and broken the arraye of the Ennemie. Others haue vsed Hooked Wagons and other Engines, whiche of their owne Violence by secrete inward Motions do worke the like effects.

Some aswell to resist these Engines, as also the charge of Launces and Barbed Horses, haue caused euerie Souldiour of the firste Ranks of their battell to haue Stakes of foure or fife fote in length, sharpe at bothe endes, and those to thrust into the earth, bending them towards the Ennemie, and to couer them with their bodies, til they see the Ennemie giue the charge, then presently to retire, and receiue them vpon those ranks of Stakes.

*Sylla against Archelaus.*

*The English against the French at Agincourt.*

Some finding themselves too weake to giue their Ennemies Battell, haue entred into Parle of Peace, seeming as though they were ready to yelde to any Conditions, and by that meane prolonged the time, till either they mighte haue further supply from their friends, or oportunitie to marche secretly away.

*Sylla in Cappadocia.*

Some finding themselves too weake to giue their Ennemies Battell, haue dispersed their Souldiours into sundry Townes, and Castels, Fortifying and Mithwalling those their Holdes, and so by prolonging the Warres, consumed their enemies Treasure, and thereby dissolued the Armie, which otherwise they had neuer bin able to defeate. Thys Pollicie is beste to be vsed when Winter draweth on, whiche in these Northerne Countreys is a sufficient Ennemie to consume anye great Armie that shall then still keepe the fielde.

*The Prince of Orange against the Spaniards in the lowe Countries.*

Some hauing one of their Townes besieged, to giue them a supply of Men and Mithualles, haue with their Armie marched on, bruting by espiall, that they meante to giue the Ennemie Battell, who presently hath leuied his Siege, and marched on to meete hym, the rather to auoyde Sallies oute of the Towne on their backe during the fighte: But so soone as by this pollicie they had

*Francis the French King against the Emperour Charles the first at Landisfe.*

*E.g.*

*with*



withdrowne the Siege, and entred certaine Bandes with a proportion of Victuals, secretly the next nighte they Dis-camped and marched awaye.

The Lorde  
Poeninges at Sas  
merdeboys in  
Fraunce.

Some hauing summoned a Castell, strongly Scituate vpon an hil, enuironed with Marishe, in suche sorte, that it was thought impossible to bring the Cannon to batter it, and therefore the Captaine of the Castell, refusing to yeeld except he might see the Cannon: The Generall wythoute, hath secretly caused a Cannon of Woodde to be artificially made and coloured, Hurdles to be laide vpon the Marish, a number of Horses to drawe the Carriages, as though with greates difficultie they had drawn a Cannon indæde, and then thzeatning, that according to the Lawe of Armes they shoulde be all put to the Sword, if they did abide y<sup>e</sup> Batterie: The Captaine of the Castell abused by thys Stratageme, hath surrendred the Forte by Composition, whiche otherwise hadde coste a number of mens liues befoze they shoulde haue gotten it.

King Henry the  
eight to vvinne  
Bulleine.

M<sup>rs</sup>ieur Lautrech  
to vvinne Pavia  
in Italy.

Some determining to surprize one strong Towne, haue firste offered to laye siege to some other thereby, suffering it notwithstanding to be supplied from the other (whiche they meante indæde to bessege) with Victuals, Munition, and Souldiors: whyche done, they haue immediately bent their whole forces vpon that Towne from whence these Supplies departed, and finding the same by thys Pollicie the moze disfurnished, haue in shorter tyme atchieued it.

The Prince of  
Orange to vvin  
Middleboroughe  
and diuers other  
strong Towns  
in Zeland and  
Holland.

Don Iohn de  
Austria to gette  
Philpville.

Some knowing a Towne so strongly scituate, and well fortified, that by force of Batterie, Scale, or Mine, they hadde no hope to gette it, haue onely wasted and spoiled the Countrey rounde aboute them, cutting off all supplye of Victualles from them, not suffering anye of the people to issue forth, and so in tyme by Famine onely inforced it to yeelde, whyche otherwise wythoute maruelous slaughters, and Butcherie of menne coulde neuer haue bene gayned.

gained.

Some by giftes and promises haue corrupted the chiefe Capitaines, or set Dissention betwene the Souldiours and Citizens: Or maintained some Faction before begonne among them. And then by espiall hauing intelligence when matters were grown to ripenesse and perfection, giuing the one side secrete aide, vpon the sodaine haue surprisid the other Faction, and wonne the Towne.

*Castruccio for the gayning of diuers States in Tuscane.*

Some hauing a Towne of theirs besieged with suche an Armie as they were not able to leaue wth anye power of theyr owne, haue by cutting open certayne Banckes, let in the Sea, in such abundaunce, that they haue drowned all the Countrey saue onely certaine Villes and Banckes, wherevppon after their enimies were retired, with small flat botomed Boates for that purpose prepared, they haue victualled their friends besieged, and supplied them with men and munition: And by that meanes saued and rescued the Townes, that otherwise of Necessitie must shortly haue bin losse.

*The Prince of Orange for rescue of Townes in Holland and Zeland.*

Some hauing laide siege to a strong Town, vpon a Sallie made by the Citizens, haue fained flight, abandoning their Campe, suffering the besieged enimies to take a spoile thereof. But after they had allured by that pollicie greate numbers of the Souldiours and Citizens to this spoile, they haue from secrete Ambushes sette vpon these Citizens thus laden with Spoiles, and pursuing the slaughter of them, (euen to the Wallles and Gates of the Towne) haue entred pele mele with them, and by that pollicie possessed the Citie.

*A Pollicie put in execution by Hannibal.*

Some hauing a Breache made in the Curtaine of theyr Towne or Bulwarke, haue inwardly made certaine Countertrenches and secrete Mines, laying in them Barrells of Powder, and other murthering Fireballes, and vpon the assault giuen, haue retyred themselues, suffering their Enimies in great numbers to enter, maintayning their inward

*Counte Pietro Nauarise in Italy. did by these meanes many notable seruices.*

*Practised also in this laste siege of Maestricht.*

Æ. liij.

Tren-

Trenches, till suche time as they did see Oportunitie, and then giuing fire to their secreete Mines, haue made so great a slaughter of their enimies, that folowing the same confusion and disorder with a couragious Gallie, they mighte haue leued the siege.

Some seeing they? Towne no longer possible to be defended, haue in the night set fire thereon, and made a Gallie oute, on that parte where they perceined the Siege weakest, & by that means haue saued a great parte of their people, not without y<sup>e</sup> slaughter of many of they? Enimies.

*Mythridates pursued by Lucullus.*  
And

*Tryphon King of Syria folowed by Antiochus.*

*Also Froto King of Denmarke in England.*

Some being by they? Enimies pursued, haue lette dispersed behinde them Treasure here and there, and whyles they? Aduersaries haue stayed to gather that Spoyle, they haue escaped. Others haue of purpose suffered they? Enimies to take the spoyle of they? Carriages and Baggages, and beeyng so laden and disordered with their Spoiles, haue sette vpon them and defeated them.

*Hannibal of Carthage entroned by Fabius Maximus in the Mountaines of Italy.*

*The Spaniards by the Frenche pursued vpon their retire from the siege of Marsilia in Prouence.*

Some beeyng pursued by an Ennemie of force, and fyndyng themselves no waye able to deale wyth hym in Battayle, nor seeing anye other meane to saue their people, haue contrarpe to all Warlike Discipline, caused their Souldiours to disperse themselves severall wayes wythoute order, without Ensigne displayed, or Drumme sounded, and euerpe manne to make the beste shifte he coulde, appointing them some other place, whither suche as coulde escape, should make their repaire: and by this disorder, haue saued the greater parte of they? people, whyche other wise had bene assured to haue perished. But this is a Pollicie neuer to be put in execution, but vpon greate extremitie: For more honoure is it for a Generall, in common opinion, by Battel maintaining Militaire Orders, to be vanquished, than by disorderly flying, in this sort to saue himself, & some parte of his people. And yet haue the mosse famous Generalles vpon extremitie put it in use, & thereby made hed againe vpon the Enmy, & recovered



couered their honoz, which other wise had vtterly bin lost.

Some being inuaded by an Enimy strong in Horse, haue onely fronted him in the field, determining by no meanes to giue him Battell, but impaling his owne Fanterie with Carriages, both Martching and Encamping bathe main-  
tained hymselfe in suche strength, that albeit his Armie were farre lesse, yet was it not possible for his. Aduersarie with Horsemen to enter vpon him, and thereby with tyme onely hath so impouerished hys Enimie, that finding Forrage also to faile him for suche a multitude of Horse, hath bin oueruen without stroke striking to retire.

The Duke of  
Alba against the  
Prince of Orange

Some being by a Foraine Enimie inuaded, haue thought it the beste meanes to leue an Armie, and likewise to inuade the Countrey of that Enimie: And some hauing their Countreys by Seas disloynd, after that he hadde by Shipping transported his Armie, by Necessitie to make his Souldiours valiant, bathe burnt his owne Shippes, showing his Souldiours, that nowe there was no remedy, but eyther by Victorie to commaund all, or to expecte present death, or that muche worse is, perpetuall Slauerie: And by this Necessitie his Souldiours gathering Vertue and Courage, haue obtained their desire.

Scipio agaynst  
Hannibal.

Agathocles a-  
gainst the Car-  
thagians.

Some being inuaded by a puissant Enimie in the daye of Battell, haue deferred the fight, till a good parte of the day was spent, knowing, that if their Enimie did preuaile, yet the night coming on them, they shoulde not so well be able to pursue the Victorie, but that they being in theyr own Countrey, and acquainted how al Straites & Passages, & places of strength lay for the, being protected by the darke night, might the better escape & make hed again vpon their Enimies. And contrariwise, if the Inuaders shoulde be broken, the night coming on them, and being ignorant of the coutry, they shoulde haue no place of Refuge, but dispersing themselves as Fortune and Chaunce shoulde leade them, coulde not but fall into the handes of theyr Enimies;

Jugurtha in Af-  
rike agaynst  
the Romanes.

who

who presently knewe all Straites and Passages, where to lye in readinesse to receiue them. A policie not vnmee to be remembred of all suche as in their owne Countries are inuaded.

*Scanderberg a-  
gainste the  
greate Turke.*

Some expecting the inuasion of some puissant Enimie haue not leued anye Armie of force to giue them Battell, but onely certaine selecte Bandes of light Horse and Fote-men lightly armed, & causing all the people of the frontiers to withdraue themselues, their Cattell, Corno, and Substaunce, into the strong and fortified places of the Country, haue with those selecte Bandes faced the Enimie on the frontiers, by keeping of Straites and Passages, making sodain attempts in the night, and such other times as by espiall they found the Enimie carelesse: And so with a few people, by Time, Famine, and Expences, haue wearied the Enimies, & caused the retyze, that happily in Battell might haue gotten the Victorie, and so commanded the whole.

*The Flushing-  
gers against the  
Duke of Medina  
his Nauie.*

Some being inuaded by Sea, haue immediatly befoze the appoche of the Enimie, caused their Buoyes and other Sea-markes to be changed and remoued, whereby the Enimies mistaking the Chanelles, haue fallen wyth the greater parte of their shauie vpon the Shelues and Sandes: And being in that sorte encombred, haue bene assayled by those their Defendaunt Enimies, taken, ransacked, and spoyle.

*Hannibal against  
Fabius Maximus.*

Some inuading the Enimies Countrey, and spoiling all the Province where they came, haue onely spared the houses and possessions of some one or other person among their Aduersaries, whome they did knowe to be of greatest Wisedome and Valure, of purpose to discredite them, and make them suspected, whereby their Counsell shoulde not carrie Authozitie, or be followed.

*Practised by  
Metellus in Afe-  
rike against  
Iugurth.*

Some haue written Letters to some of the principall Counsellors of their Aduersaries, as it were touching some practise of Treason betwixen them, and by corrupted espiall founde



founde the meanes that those Letters haue bene intercepted, and brought to the General on the other side, who for Icalousie thereon conceived, hath not only reiected, but also murdered those his most assured, Wise, and faithful Counsellours.

Some to bzing their Enimies (that were strongly encamped) into the playn fielde where they might fight with the, haue of purpose suffered some one to escape, who as a Fugitive flying to the Enimies, hath declared that there was a Mutinie in their Campe, and immediately of purpose the Bandes haue diuided themselues, and with Ensignes Displayed, marched contrariwayes, whereupon the enimies to vse the aduantage of this Occasiō haue left their strength to pursue them: And by that Pollicie turning vpon them haue defeated them.

Some sending Ambassadours to their Enimies, haue put certaine of their wisest and most experte Captaines in the habite of seruauntes and Lackeys, who comming into the Camp of their Enimies vnder colour to solow some Horse of theirs that of purpose they let go, haue sene, perused, and noted many particularities, wherby they haue afterwards assayed and defeated their enimies Armie.

*scipio to King  
Siphax in  
Aphricke.*

Some haue banished some one of their most assured and trustie seruaunts, who confedering himselfe with the Enimie, and seeming to betray some Secrets, hath from tyme to tyme aduertised his maister of the whole estate of his aduersaries.

Some haue corrupted the Enimies Espial, and by that meanes abusing them, haue trayned their aduersaries into great inconuenience: A Practise aboue all other to worke great effectes, if it be discretely handled.

A General may sometimes inuent and spreade Rumors of ayde and assistance from Forraine Princes, or such like, to Annimate his owne people, & terrify his aduersarie. But such Pollicie must be used moze rarely and with great Discretion.

*P.*

The



The Actions Militare being such as require present Resolutions, and leaue no time for Consultation, a General ought alwayes to be so prepared with prudent preconsideration, that no accident maye happen for the which he had no fore-thought his Remedic.

He ought by all meanes to purchase good Espial, and not to spare any charges to be wel informed from time to time of the estate of his Aduersarie, his preparation, order, furniture, and determinations, accordingly to dispose of his owne Armie. And hereby shal a wise General, vsing Oportunitie and occasions offered, oftentimes wpyth smal Troupes, do wonderfull great and famous Seruices.

I might here adioyne another large booke of Approching, Besieging and winning of Townes and Castels, by Scale, Myne, Batterie, and Famine: Also the Art to Defend, & Garde Forts, & Cities, by outward & inward Fortifications, with sundry other Militare Stratagemes, and Pollicies, put in execution by prudent, valiaunt Captaines, wherby they haue attained miraculous Victories, and contrarie to al expectation haue escaped imminente Perils. For such Precedentes ought a wise General to haue readily in his memorie upon any oportunitie offered, to be ready to put the like in execution, and to be so prepared, that no such Accident or mischief can happen, for the which he should not be provided of his Remedic.

But of this and many other, necessarie for the honorable charge of a General, I shal haue occasion to intreate in other my Militare workes of Fortificatiō and Pirotectny. &c, leauing farther at this time to wade therein: Only I haue annexed two Plats, the one of a Campe to lodge 30000 Footemen and 6000 horsemen strongly and commodiously: the other is an order of Embattelling the same Armie in playne grounde, where the Scituation yeeldeth no aduantage. And so I meane to finishe this Treatise.

VIS CONSILII EXPERS, MOLE RVIT SV. A.]



## ¶ The declaration of the Campe. Chap. 16.



Or strong and commodious encamping of an Armie, the Lord High Marshal is firste to finde such a place to encampe upon, as may be conueniently woodded & watred, not subiect to any Hil within Culuering shot, and to apply the forme of his Campe to the nature of the Scituation. But this plat I haue prescribed where all those natural helpes fayle: And that the

Generall is to truste onely to his owne order, and Artificial strength.

When any Armie is therefore in such place to be Encamped, ye shal first in the most commodious place, about the middest of the grounde where yee meane to encampe, set up the Generals Standerde, and aboute the same stake out a square plat of ground 40 pace square for the Generals Pauilion. Directly from this towards the North runneth one mayne streete 40 pace broad, that diuideth the Horse Campe from the Foote Campe: And on eyther side of the Generals tente runneth two other crosse wayes thirtie pace in breadth, which diuide the Armed from the Vnarmed, as hereafter shal appeare.

These two wayes imbrace two long Squares of grounde fortie pace broad, and 550 pace long apeece. These maye be eyther of them diuided into fise lodgings of a hundered pace in length, and fortie in breadth, leauing betweene them certayne passages of tenne pace in breadth, that Souldiours vpon euerye suddaine maye the more readilye repaire to the place of assemblye.

T.ij.

One

*One of these lodgings next the Generals tente may serue for the Highmarshal & his retinue. And the other on the other side for the Treasurer, the rest may be assigned at the Marshals discretion to the other Officers of the fielde, and for Ambassadours, and suche noblemenne and Gentlemen as follow the wars on their owne charge, and such like.*

*In the Northeft quarter of the Campe are the Horsmen lodged: In the Northwest the Footemen. Either of these Campes are diuided into three partes by streetes running Easte and West. These streetes are 20 pace in breadth, and 580 pace long. In euery of these three spaces of the Foote campe there are lodged a Regiment of 10000 men: and in the Horsecampe, the middlemost of the shal serue for 1500 me at Armes. The Northern space may serue for the 2500 Light Horsmen: and the other for the 2000 Demilaunces.*

*On the other side of this mayne streete are the lodgings assigned for the leaders or Gouvernours of euerye regimēte & their Officers: Euery space being 30 pace broade, and 170 long. A is for the Captaine of the Demilaunces, B for the Captaine of the men at Armes. And C for the Captaine of the Light Horsmen.*

*Likewise D E F for the leaders of the three principal regimēts of Footemen, the which ye may distinguish with the vsual names, Vawarde, Battayle, and Reregarde, calling the Vawarde that which lyeth next the Generals tente, and aunswereth to the Demilaunces: The Battel that whiche aunswereth to the men at Armes: And the Rerewarde the other againste the lighte horsmen.*

*Euery of these principal Regimentes ye maye againe diuide into fwe smaller Regimentes by streetes of tenne pace broade, running North and South, so haue yee fiteene lesse Regimentes in the Foote Campe. And fwe a peece in euerye of the Horse Campes: And euerye of these Regimentes are 100 pace broade, and 170 pace in length. And shall  
containe*



conteyne euerie of them of footemen 2000, of men at armes 300, of Demilances 400, of light Horsemen 500, with their Coronels, and their officers. &c.

These Coronels and Captaynes of men at Armes, may bee lodged at the head of their Regiments, as you maye beholde in the Camp. Those marked with G. are for the Coronell of Footemen, H. for the Captayne of light horsemen, I. for the Captaynes of men at Armes, and K. for the Captaynes of the Demilances. So remaine there Regiments of 100 paze broade, and 150 paze long for lodging of the Souldiours, whiche may, by small streetes of five paze broade, be diuided into as many spaces, as there are seuerall bands in euerie Regiment, and then the Harbinger of euery band must set downe the Officers and Souldiours of their bands.

These last diuisions of bands I haue omitted, bycause in so small a plat it woulde breede but confusion, and the thing being of it selfe most plaine, it should be but tedious to rest longer there-upon.

This only I would wish the Camp Mayster to obserue, that his Shot be lodged towards the outside of the Camp, that they may be alwayes readie at the ring of the Campe upon any Alarme. The whiche he maye do by diuiding the utmost seauen regiments into halfe, as you see by the pricked lines, leauing the seauen spaces marked with L. for the 7000 Shot, and the other noted with M. for 7000 Pikes, all the other Regiments marked with N. shall be the Lodgings of the 16000 short weapons.

Thus in the North moytie of your Campe, are all your Armed both horsemen and footemen lodged.

Now the other moytie must serue for the lodging of the vnarmed, as Pioners, Carters, Carpenters, Smithes, Butchers, Victualers, and all other sortes of Mechanicall Artificers, together with a large place of Assembly for the Souldiours to retire vnto, to put themselues in order upon any Alarme, and also to exercise themselues in sundrie sorts of Actiuitie.

You shall therefore from the Southside of the Generals Pauilion 600 paze Southward, extend out your first maine streete of 40 paze broade, and crosse hym agayne with another streete, running East

Tij.

and

and Weast, 360 pase distante from the Southside of the Generalls Pavilion. This streete neede bee but thirtie pase in breadth. Agayne, extende out the seconde narrowe streetes, that runne parallel to the firste mayne streete, till you come to this crosse streete last made, so haue you O your place of Assemblie three hundred and thirtie pase broade, and five hundred and fortie pase long. P shall be appoynted for the Munition, and Officers attendante on the Artillerie. Q the Market place. Rounde aboute this Market place may be lodged the Butchers, Bakers, Cookes, and Victuallers of all sortes.

About the Munition quarter, besides the Officers and Gunners, may the Smithes, Carpenters, Whelewrights, and Labourers attendante on the Ordinance be placed.

Aboute the place of Assemblie, may be the Tentcs of all such as furnishe the Campe with things needefull for the Souldiours, as Armourers, Taylers, Shoomakers, and all suche like Artificers.

Yet remayne there two long Squares of earth, eyther of them five hundred and fortie pase long, and one hundred and nintie pase broade: heere you maye settle the Carters and Waggoners, wyth their Horse and Oxen, for the Carriadges themselves must alwayes Impale that parte of the Campe that is not otherwise by Nature or Arte Fortified.

In these two Quarters also maye bee lodged the Pioners, and all other sortes of Labourers, that aptlie can not, or oughte not bee placed in or aboute the former Courtes or quarters of Assemblie.

Last of all, you shall describe threescore pase distante from all those Regimentes, and their Quarters already set downe, the Ring of the Campe, causing some prettie Trench and Vauinure to bee thrown up, placing youre Ordinance vpon the same, as in the Figure is described, and betweene the Ordinance youre Carriadges: and this maye suffice, if the Enimie bee not verie puissante, or neere at hande: but if you suspect the arrinall of the Enimie,



*nimie, or that you know him stronger in the Fielde than your selfe, and woulde therefore Encampe surelie till farther ayde come unto you, then shall you without this Ring, an hundred pase distant, cause your Pioners and Souldiours (for upon such occasion, hee is not woorthie to beare the name of a Souldioure, that will not sette his hande to the spade) you shall cause them I say throw vpp another Rampire, with certaine Bulwarkes at euerie corner, and likewise in the middle of the Curtayne, that Musket Shotte maye play betweene them, or if time woulde permitte, it were conueniente euerie twelue score to haue of these Circulare Platterformes, with a Vamure, to defende the small Shotte, for in so shorte time it is impossible to make anie sufficiente Rampyre to abide a Batterie, neyther can a Campe bee furnished of Victuals to abide anie long tyme, and that is the cause why I haue described these plaine Circulare formes, which in Fortification of a Towne or Forte were meere ridiculous, and in a Campe to make them more exquisite, were no lesse foolish Curious.*

*Howe this Campe shoulde bee Watched and Warded, I haue declared in the Office of the Scoutemayster, but what kindes of Engins may bee prepared for defence, I reserve for my Treatise of Fortification and Pyrotectny, admonishing in the meane time all suche Noble and free mindes, as take delighte in the Sciences Liberall, and conet knowledge in this Arte of greate Artillerie, or Fortification of Townes, Fortes, or Campes, agaynst the furie of this newe Engine. &c. to acquaynte themselves with so muche of the Science of Numbers, both Vulgare and Cossicall, as I haue in this Treatise taughte, and a<sup>ke</sup> with so muche of the Science of Geometrie, as concerneth the measuring of Lengthes, Heyghthes, and Distances, the making of Mappes, and Plattes in true measure and Proportion, and the Supputation of the contentes Superficiall, as you maye reade, at large sette downe in my other Treatise Geome-*

The old English  
Encamping, no-  
ted by Guicciar-  
dine in his Ita-  
lian Historie.



Geometricall named Pantometria, so shall they be prepared  
for my other workes, and for atteyning suche perfection in the Arte  
of Souldiorie, for all kindes of seruices Offensiuē or Defen-  
siue, by Lande or Sea in manner howsoener. As with-  
out these knowledges, can not be so much  
as Aymed at, and much lesse ef-  
fectuallie atchiued.

(::)

LABORE ET VIGILANTIA.



# A Declaration of the Bat-

west.

B  
taile

seruice, as now a dayes is used, I note it is  
fore in this forme of Battaille, that I will now set downe, sought a  
meane course not so exquisite, but that the Soldiers of our time  
might be able to learne, and put in execution.

Z.

Geometricall named Pantometria, so shall they be prepared  
for my other workes, and for atteyning suche perfection in the Arte  
of Souldiorie for all

n-

The Works of Henry



## A Declaration of the Battaille in Portraiture.



*These Souldiers thus orderly lodged in their severall Regiments every one distant from other, may most easely and readily after the usuall manner be ranged into three severall battailes, armed with Pikes, and flanked with Shot. But because I have already in my Arithmetical questions, upon the Sericant Maiors office declared how these kindes of embattailing, and also the Mayne square armed rounde with Pikes may be readily framed, I have thought good heere to set downe a forme of Battaile more serviceable and forcible than those common sortes.*

*And although these 30000 Footemen, & 6000 Horsemen, may by the ingenious Sericant generall according to the nature of the Place be sorted and denided into an infinite number of other serviceable formes of Battaile: Yet I thought good to set downe one of that sorte, where no aduantage is gained by the nature of the place, but that the Generall is onely to trust to the strength of his good order.*



*And albeit I would wish such perfection in our Soldiorie, as was in the Romane, that they might be able to fight, and retire in order, & so make many sundry Heades upon the Enemie, if Fortune did abandon them in the first or second encounter: yet considering how our Soldiorie in these dayes are trained, I thinke it utterly vaine to practize the Romane order, albeit of all other it were with perfect Soldiors the most inuincible.*

*But to vse still our common brute mayne Battaile, or three Battailles in one Fronte, committing the whole fiede to one brunte of service, as now a dayes is used, I hold it barbarous, and haue therefore in this forme of Battaile, that I will now set downe, sought a meane course not so exquisite, but that the Soldiers of our time might be able to learne, and put in execution.*

## 178 STRATIOTICOS.

I haue first therefore deuided the Armie into two fronts or faces: The first as ye may beholde I haue separated into 8 Battalions, euery of them hauing 30 in a ranke, and 33 rankes. They are armed in the fronte with 7 rankes of Pikes, all the rest short weapon, as Swordes and Targets, Halberdes, Billes, or such like. Euery Battalion cōteineth 1000 men lacking 10, & are placed three or foure paces one from another.

The second front is deuided into 5 greater Battalions, euery one of them being of 2000 men, 40 in a Ranke, and 50 Rankes, euery Battalion armed in the Front with 6 rankes of Pikes. These Battalions are one from an other at least 25 pases, and the one Front of Battailles from the other at least 60 paces. In or nigh the middle Battalion of this second Front shalbe the Generall himselfe when he seeth time.

These Battalions are impaled on either side with an hundred Ranke of Pikes, 7 in a ranke, and on the Baske with sixe Ranke of Pikes: Without these haue I placed my shot marked with this signe  in 24 Troupes, euery Troupe containing an 100. There is also in the Forelorne hope before the face of the Battayle, likewise 18 Troupes of shot of an 100 a peece, their order yee maye note by this figure : But after they come to face the Enemie, they must Disband and maineteine skirmish, as heeretofore more perticularly hath bene declared.

Last of all are the Winges of Horsemen on either side, deuided into 3 Troupes. The two first are the men at Armes 30 in a Ranke and 25 Rankes. The two second are Demilaunces 30 in a Ranke, and 33 Rankes. The last are the Light Horsemen 50 in a Ranke, and 25 Rankes.

Thus haue ye in the first Front of Pikes, 1680. In the second Front 1200. In the Empalement 3800. These in all amount to 6680. So is there lefte 320 Pikes to be employed in loose fleeces to accompany such Shot, and short Weapon, as shal remaine for the garde of the Ordinaunce.

Likewise in the first Frunt there are of shorte Weapons 6240 in the second Front 8800. So doe remaine 960 short Weapons to be employed



*employed together with the remnant of the Pikes for garde of the Artillerie or Cariadges, or els to mingle with the Shot in the Forelorne hope, the which when they shall grow pele meale with the Enemie, will be able to doe great service.*

*Also after the Battailes approach, they may retire with the Forelorne hope to assist their Horsemen.*

*The Shot ye may behold sorted in Troupes 1800 in the Front, & in either Wing 2400, so doe there remaine 400 Shot more to ioyne with the Pikes and Short weapons extraordinarie in anye of the foresaid seruices.*

*Thus after the great Ordinaunce on either side haue discharged, the Forelorne hope is continuallye to be supplied with newe Troupes of Shot from the Flankes & Winges, & these Troupes of the Forelorne hope that haue discharged shoulde retire betweene the Battaile & the Troupes of Horse to the Backe of the Wings, so mainstaining the Flankes alwaies furnished. And thus may they (being welled) maintaine Skirmish continually with fresh men, and the Battaile alwayes impaled.*

*But after the Battailes begin to approach, the Forelorne hope must withdraw themselues: Then is your first Battaile strongly fronted & impaled with Pikes to abide any charge of Horsemen, & after their Pikes be broke, are together with the rest of the short weapon to deale with the Enemie, and during the continuance of the Fight, betweene these Battallions the Shot may continuallye discharge in the face of the Enemie.*

*Likewise ther may be made certain smal Carriadges, some laded with Muskets, some with Calabashes, others with murderig Fire balles: & these Carriages may during the Battaile continually spoile the Enemies Front, being safely garded betweene the Battallions.*

*The fashion of these Carriages, & many other seruiceable Engins, not yet practized, I reserue to my treatize of Pirotechnye and Fortification.*

*But if Fortune should abandon them in the first encounter, & that they be broke by the Enemies, yet haue they those ample spaces between the Battallions of the second Front to retire vnto, ther to make Head, and giue the Enemie Battaile againe.*

*And these Spaces or Lanes between the Battallions serue not only to*



# 180 STRATIOTICOS.

receiue the Skirmishers or other that shall retire, but also for the Messengers which among the Romanes were called Mandatores, to passe too and fro, and to signifie to all partes from time to time the Generalls pleasure.

Of the Horsemen the men at Armes are first placed, who are first on the Flanke of the Enemie to giue the charge when time is. The Demilaunces are to followe them if they haue victorie, or to assist them if they be repulsed or charged by the Enemie: And the Bandes of Light horsmen to giue ayde to them both, and also to follow the chase when the Footemen are broken.

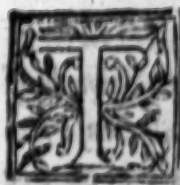
What scope of ground this whole Battaile, & particularly, euery of his Battallions, Troupes, Empalements, &c. requireth, the Scale discovereth: And superfluous were it to vse moe wordes in this matter.



FABER EST QVISQVÆ FOR-  
TVNÆ SVÆ.



**C**erteine Questions in the Arte of  
*Artillerie*, by *Mathematical Science*  
 ioyned vvith Experience, tobe deba-  
 ted and discussed. Chap. 18.



**T**He diuersitie of the force & violence of great Ar-  
 tillerie, & of the farre or nigh shooting & variable  
 randge of their Bullets, doth chiefly arise & grow  
 of these 4 principall causes: Powder, Peece, Bullet,  
 & Randō. In Powder is cōsidered *Quantitie & Qualitie*. In the  
 Peece the length & proportiō of the Cylinder. In the Bullet his  
 waight & *Quantitie*. In Randō the degrees of Altitude frō the  
 Horizon or plain wher the Peece must play. These may be called  
 the Prime, substantiall or effectuall causes.

There are also other causes and circumstaunces which may like-  
 wise worke some alteration: as the Raritie or Densitie of the ayre.  
 The Winde. The diuers wadding and ramming in chardging.  
 The inequalitye of the ground or Plat-forine, and wheelles of the  
 Carriage reculing. The regular or irregular Boring. The distē-  
 pering of the Peece hotte or colde, and well or ill fitting the Bullet.  
 These may be termed secundarie or accidentall causes of altera-  
 tion, which by Practize and vse will best be learned, and their er-  
 rours by discretion reformed, albeit for some of them certain Rules  
 may also be prescribed.

But these Questions ensuing, are onely of such Alterations as  
 grow by those first foure principal or substantiall causes, supposing  
 all these other accidentall by good discretion well ordered and vni-  
 formely gnyded. And first of Powder.

Of Povvder.

**VV**Hether there be not for any Peece proponed, such a cer-  
 taine *Quantitie* of Powder to be found, as duely to the  
 charge

charge of the same Peece agreeth, and that in such sort that charging the Peece with more or lesse than that Quantitie, it shall hinder the farrer ranging of the Bullet.

2 Whether one & the selfe same Peece twice charged with one & the selfe same Quātitie of Powder & Bullet, discharged also at the same Randon, shal make the same Randges, hauing all one manner of Chardging, Wadding & Ramming.

3 If a Peece be discharged with the waight of his Bullet in Serpentine Powder, & afterwards againe discharged with the half waight of his Bullet in such Corne powder as shall cause the Peece to cast the same ground, I demaund if the same Peece bee again charged with halfe the quantitie of either sort, whether these second Randges shall also be equall? the forme of charging being uniforme, and temper of the Peece all alyke.

4 If two Peeces of the same Length & Bullet be charged with one kinde of Pouder, but seuerall Waights, I demaund whether the Randges shalbe proportionall to the said waights, or to  $\sqrt[3]{x}$  or  $\sqrt{x}$  Rootes of the said waights, or whether the proportiō of those Rāges be not to be found without any farder respect either to the Length of the Peece or Ponderositie of the Bullet, considering by Hypothesis al those are equall.

5 Whether the Proportion found in one kinde of Pouder, hold not in al other kindes, of what mixture soener it be, the Peeces and Bullets being as is before supposed equall.

6 One Peece being charged first with one quarter of the waight of the Bullet, after with one halfe finally with the whole Waight & the Ranges of the Bullet at Point Blanke noted, I demaund Whether the same Ranges be not Proportional, al circumstances of charging &c. being uniforme.

7 Whether the Proportion of such Ranges be not a meane proportional resulting of the commixtion of the Equalitie of the Peeces Lengths and Bullets, and of the Inequalitie of the Powders Quantitie, the Qualitie being supposed lyke.

Of the length of the Peece and Pouder.

VV Hether two Peeces being in al respects equal, saving on-  
ly



ly in Length, being charged with one Bullet, and one Quantitie of Powder, shall not make severall Grazes.

2 Whether the longer Canon shall make the greater Range, what soever Quantitie or kinde of Powder they be discharged withall, the Quantitie of Powder being equall.

3 Whether there be not a certain convenient Length of the Peece in respect of his Bore or Bullet, to make the utmost Range, in such sort that the making of the Canon longer shall rather hinder than further.

3 Whether this Length and Proportion being found in one Peece hold in all other (the proportion I meane) for the length must of necessitie alter.

4 The Proportion being by Experience found with Serpentine Powder according to the ordinary charge, whether giving like quantitie of Corne Powder, the same Proportion of perfection shall hold, or a new be to be sought in respect of the alteration of the Powder.

6 If two Peeces being in all respects equal save onely in Length, being discharged with one Bullet & Quantitie of one sort of Powder make severall Ranges at Point blanke discharged: I demand whether the same proportion of Ranges shall still continue with what soever Quantitie or kinde of Powder the same Peeces be charged? the Quantitie being alway equall & all other circumstances of charging & discharging in either of them lyke.

If two Peeces in all respects like save only in Length be charged with one Bullet, and the weight of the same Bullet in ordinarie Serpentine Powder, I demand whether their Ranges shall beare the proportion of the length of their Canons, or of the Vacant hollow Canons from the Charge to the Mouth. Or if it be not the same proportion, whether they carry not the proportion, of the  $\sqrt{v}$  or  $\sqrt{x}$  Rootes considering all other circumstances being Equall save only the Longitude of the Canons, it is apparant that from their proportion as the original cause, the Proportion of the Ranges must in this case be derived.

8 If there be 3 Peeces in all respects equal save only in length of their Canons or Cilinders & yet those 3 Longitudes proportional, I demand whe-

whether the ranges of their Bullets shall not be proportionall, all other circumstances saue onely this of Lengthes, being one, equall and like.

9 If ther be 3 Peeces, as afore, hauing the Lōgitude of their hollow or vacāt Cilinders proportionall, whether thē all the rest being equall and uniforme, the Ranges shall not be proportionall.

10 Or if in one of these cases the proportion of the Ranges be not a meane proportionall resulting of the commixtion of the Equalitie of the Bullets weights, the Equalitie of the Pouder, and the Inequality of the longitude of the Cylinders either whole or vacāt.

### Of the Pouder and length of the Peece considered with the Bullet.

**I**F a Peece be twice discharged with one quantitie of the same Powder, but the Bullets in waight different, I demaund whether the lighter shal alway out-flye the heauier, or that some conuenient waight may be found.

2 Whether this conuenient waight of the Bullet alter not according to the Quantitie or validitie of the Powder.

3 Whether to finde the said conuenient Ponderositie of the Bullet it be sufficiēt to consider the Powder, or that the Lōgitude of the Peece also cause therein a diuersitie.

4 If a Peece be twice charged, first with an Iron, then with a Ledde shot, the quantities of Powder at both times equall: whether the difference of the ranges be not deriued onely from the proportion of the waights of these bullets, all other circumstances by Hipothesis differing not. And what relation to the Ponderositie of the Bullets these Ranges haue.

5 Two Peeces being in all respects equall and charged with one kinde of Powder, but different Bullets, the one Tron, the other Lead, and either hauing the waight of his Bullet, I demaund whether the Ranges be equall.

6 If one Peece be charged three senerall times, first with a  
Stone

Bullet charg'd with Iron finally with Lead, & the Iron of such

its wayght betweene  
the quantitie of Pouder, I  
the annual proportion.

on, then with Lead,  
as noted: I demand  
of Pouder, the Rā  
the same proportiō,  
in one Peece of the  
make, whether the  
or shorter, shooting

e I finde two suche  
with the first quā-  
discharging hir with  
h duety one ground:  
h with the Falcō,  
Lead Bullet, vsing  
andges shal be pro-  
of Pouder, it shall

erēt Quantitie of  
Bullet, the other  
the waight of their  
whether either of  
Bullets in Pouder

al quātitie of Bul-  
discharged with  
I demande whe-  
mounted.

one Peece such  
longer or shorter  
hts of his Bullet  
either if another  
Peece



whether the range  
ther circumstaunce  
and like.

9 If ther be 3 Pe  
low or vacāt Cili  
equall and vniform

10 Or if in one  
a meane proportion  
of the Bullets weig  
qualitie of the lon

Of the

Pe

**I**F a Peece be  
Powder, but the  
ther the lighter sh  
nient waight may

2 Whether  
ording to the Q

3 Whether  
Bullet it be suffi  
of the Peece also

4 If a Peece  
Ledde shot, the  
ther the differen  
portion of the m  
Hypothesis d  
tie of the Bullet

5 Two Pee  
one kinde of Pow  
Lead, and eith  
ther the Rang

6 If one Peece be charged with

Stone

*Some Bullet, then with Iron, finally with Lead, & the Iron of such temper that it be an exact meane proportional in wayght betweene the other two, being al discharged with one quantitie of Pouder, I demaund whether the Randges shal be in continual proportion.*

7 *If a Peece be twice charged, first with Iron, then with Lead, hauing one quantitie of Pouder, and the Ranges noted: I demand whether being charged with any other quantity of Pouder, the Ranges of the same Bullets shal not alway retain the same proportiō.*

8 *The Proportion found by experience in one Peece of the different Randges that Iron and Lead Bullets make, whether the same proporsion hold in any other Peece longer or shorter, shooting the same Bullets, whatsoeuer hir length bee.*

9 *If in a Faulcon for example, by experience I finde two suche quantities of Pouder, as discharging the Falcō with the first quantitie of Pouder with an Iron shot: and again discharging hir with the second quantitie & a Lead shot, they range both duely one ground: I demaund whether in a Saker of the same length with the Falcō, charging hir first with an Iron Bullet, the with a Lead Bullet, vsing the same quantities of Pouder, whether their Randges shal be proportional. And whether doubling either quantitie of Pouder, it shall alter the proportion of the Randges.*

10 *If two Peeces of one length be of such differēt Quantitie of Bullet that the one being discharged with a Lead Bullet, the other with an Iron Bullet, either hauing of Pouder the waight of their Bullet, and do so make equal Ranges: I demaunde whether either of them discharged with halfe the waight of their Bullets in Pouder shal Range alike also.*

11 *If two Peeces be of one length, but of seneral quantity of Bullet, and yet of one kind of Metal or substance, and discharged with the waight of the Bullet in one kinde of Pouder, I demaunde whether they shal not range one ground being equally mounted.*

12 *If there be once found by experience in some one Peece such a perfection of a Canon, as whether ye make him longer or shorter he shal shoote lesse ground, hauing alway the waight of his Bullet of one kind of Pouder to his charge, I demaund whether if another Peece*

*Peece whose Cannō or hollow Cylinder is in proportiō like to the same though greter in quantitie, shal not be of the like perfection.*

13 *If two Peeces hauing their hollow Cylinders Similes or proportional, be discharged with the waight of their Bullets in Ponder at like Randon, I demaunde the proportion of the Ranges, the quantitie of their Cylinders known.*

14 *Of any two Peeces presented, to knowe which shal shoote farthest being both charged with the waighte of their Bullet in Ponder, the force of the Ponder being first in some one approued.*

15 *Anye two Peeces being proponed, how to charge them with such quantities of Ponder as they may both at like Randons Rage like ground.*

16 *Hauing proued any Peece at his utmost Randon with any one kinde of Ponder, to know howe to diminish the proportion of the Ponder frō time to time in suche proportion as the Peece keeping that Randon shal shoote any part you wil assigne of the first Shot.*

### Of Randons.

*Seeing it is by experience found, that euery Peece of Ordnance being at the Leuel or point Blancke discharged, throweth forth his Bullet with such Violence that it passeth a good distaunce directly without any sensible Inclination or touching of the grounde, the firste Graze that it maketh I terme the Leuel Range: and the same may also be called the righte line of the Leuel Range, the Peece being on Leuel grounde, and not mounted on a Platforme. In like sorte if a Peece mounted at any Randon be discharged, the Bullee first violently issueth out a good distance directly without making any sensible declination from the right line, by the Axis of the Peece determind, and that Distauce, maye bee termed the right line of the Randon Angle, hereof ariseth a question.*

1 *Whether the righte line of the utmost Randon be equal to the right line of the Leuel Range, or whether in al Peeces they retain one Proportion.*

2 *Whether the right line of the utmost range be not lesse than*



the right line of 90 grades of Randon.

3 Whether the right line of utmost Range be a Meane Proportional betweene the right line of the Leuel, and the right line of the Vertical Range, Viz. mounted 90 grades.

4 Whether the right line of utmost Randon be not rather a Meane Proportionall betweene the right line of the Leuell Range and that Grade of Randon that raungeth the ground of the Leuel Raunge.

5 Whether the right lines made by any two Peeces at one Randon discharged, be not Proportional to the Ranges of their Bullets at the same Randon.

6 Whether the right lines made by any two Peeces at any Randon, be not Proportional with their utmost Ranges.

7 Whether the utmost Randon, I meane to make the utmost Range, be always one, whether the ground be Leuel or ascending.

8 Whether the Bullet end his Range with a line not sensibly different from a straight line, as it doth begin his circuite.

9 Whether al Peeces at one Randon discharged, as they make one Angle at the beginning of their course, do also make one Angle at the ende of their race.

10 Whether the Angle at the end of the Circuite made with the Bullet be equal with the Angle of Randon.

11 Whether the upper part of the Circuite made by the Bullet be a portion of a Circle as Tartalea supposeth.

12 Whether it be not rather a Conical Section and different at enery several Randon.

13 Whether it be not at the utmost Randon a Sectiō Parabolical in al kind of Peeces, and to differ in greatnesse according to the greatnesse of the Cone that to enery several Cylinder or Peece of Ordinaunce is conuenient, being Proportionally charged according to the perfection heretofore mentioned.

14 Whether at al inferior Rādons that Arke by Tartalea Imagined Circular, be not an Eleipsis, & the same altering according to the capacitie of the Cone to the Peece appropriate, & also according to the difference of the Angle of Randon.

&c.

15 If

15 If the quantitie of the Cone to enerye Peece proportional-  
lie charged, be by experience founde, I demaunde whether then  
this Eleipsis shal not make an Angle with the Parabola Sec-  
tion equal to the distaunce betweene the grade of Randon propo-  
ned, and the grade of uttermost Randon.

16 Whether in al Randons above the uttermost, the sayde  
Curue Arke, be not an Hyperbole.

17 Whether the same Hyperbole do not also alter at enery  
seuerall Randon, above the sayd utmost Randon.

18 Whether the Hyperbole that delinereth this Curue Ark,  
be not such a Section as maketh with the Axis of the Cone, an  
angle equal to the Angle of the Randons Complement.

19 Whether in enerie of the Elepsical and Parabolical  
Sections there be not a continual alteration of the Angle of the  
Cone also in respect of the newe Angle of Randon.

20 Whether the Parabolical Section be not made at 45  
Grades of Randon, rather than at the Grade of utmost Randon,  
and so the Hyperbole at al Randons above, and the Elepsis as  
at inferiour Randons in manner before expressed.

**T**Hese may suffice to giue some tast how large a Sea of  
Inuentions & ingenious Mathematician hath to wade  
in, & wil aspire to the perfection of the Art of handling great  
Artilerie, & also how far off such Cannoniers are frō the first  
Elements of that Science, that being able to make some fair  
shotte from their ordinarie Plat formes, to their vsuall  
beaten Sparks, do thinke theselues therfoze perfit Masters.  
But as it is utterly impossible for Archimedes himself (if he  
wer living) without Experience, long Practise, & sundrie tri-  
als, to demonstrate & manifest manifold varieties of that mixt Helical  
Arcke or circuite of the Bullet, composed of violence, & na-  
tural motions, receyuing infinite diuersitie, according to the  
seuerall proportiōs of their Temperature: So is it far more  
impossible & absurde to imagine, that any ignozant of those  
Sciences, should euer be able to appoche the Gates of that



Art, hitherto by no Nation to any purpose handled. For to passe over the apparaunt Errours of Daniel Santbech the German in his booke *de Artificio Eiaculandi Sphaeras Tormensarias*: the false Rules of Girolamo Ruchellye, and grosse errors of many others, that being ignorant of the Mathematicals, haue takē vpon them to write of this Arte: Euen Tartalea the Italian, albeit he were an excellent Geometer, taking vpon him to deliuer sundrie Demonstrations in this newe Science, yet for wante of Practise, and Experience, hath erred euen in the first Principles, and so consequentlie in the whole substance of his discourse. This Tartalea auerreth the Angle of 45 grades, as meane betwē the Horizontal and Vertical mountes of Eleuations, to be the Angle of the utmost Randons: an Errour knowne euen to the first Practicioners. He affirmeth also the declining Arc' of the Bullet to be a Section Circulare: an Errour likewise, but not so easie to be discerned. And whereas great Fame hath bene spreade of certaine Tables by him inuented, to declare the different Ranges of Bullets from all sorts of Peeces deliuered at all Grades of Randon (a matter in deede rare, and of great inuention) thus much I dare truely avow and approue, that Tartalea vpon those his fallible groundes & Erronious principles, was neuer possibly able in those matters to deliuer anye certaintie. The same among other was in deede by my father long practised, who sayning continuall experience for many yeres with Geometrical Demonstrations, sought, and at last founde, and did frame an Instrument, with certaine Scales of Randons to performe all that by Tartalea his Tables promised. As also by Reflection of Glasses to fire Powder, and discharge Ordnance many miles distant. And such was his Felicitie and happie success, not only in these Conclusions, but also in the Optikes and Catoptrikes, that he was able by Perspective Glasses duely scituate vpon conuenient Angles, in such sorte to discover every particularitie in the Countrey rounde aboute,



whereſoeuer the Sunne beames mighte pearſe: As ſithence Archimedes, (Bakon of Oxforde only excepted) I haue not read of any in Aſion euer able by meanes natural to perſorme ſlike. Which partly grew by the aide he had by one old witten booke of the ſame Bakons Experiments, that by ſtraunge aduenture, or rather Deſtinie, came to his hands, though chiefly by conuyning continual laboꝛious Practiſe with his Mathematical Studies.

The which vpon this occaſion I thought not amiſſe to rehearſe, as wel for the known Veritie of the matter (diuerſe being yet aliue that can of their own ſight and knowledge beare faithfull witneſſe, theſe Concluſions being for pleaſure commonlye by him with his friendes practiſed) as alſo to animate ſuch Mathematicians as enioye that quiet and reſt, my ſroward Conſtellations haue hitherto denyed me, to imploy their Studies & trauels for Inuention of theſe rare ſeruiſeable Secretes. But ſuch is my harde Deſtinie, that as Gods pleaſure was to take my Father from me in my yong and tender yeares, and euen at that verie tyme when I began to grow capable of thoſe Secretes, and him ſelfe (hauing bene long debarred his owne inheritaunce & native Soyle being reſtoared) ment then immediately to reſturne to his wonted places of Exerciſe, there to haue deliuered me experimentally thoſe the fruites of his long Trauels, & Practiſes. So ſithence his death, hauing ſuffered by Studie and conference thoſe Theoretical ſparkes Mathematicall from infancie by him impreſſed, after I grew to ſome Maturitie of yeares, and iudgement, fitte to enter into triall and practiſe of theſe Concluſions, by continual Lawe Brables, (being torments as repugnant to my Nature as the Infernal Furies to Celeftial Muſes) I haue for manye yerres bene ſo vexed and turmoyled, and from thoſe delectable Studies violently baled, & of all thoſe rare Concluſions and Secrets I haue ſcarſely hitherto had any tyme of reſpoſe or quiet to waide effectually in any one, ſaue onely that of  
great

great Artillerie, wherein also there are yet many Mysteries  
that by farther proofes, and trialls Experimental, I muste  
resolue, before I can reduce that Art to suche perfection as  
can content me. But so soon as by Gods ayde I shall un-  
twine my self out of this miserable Labyrinth, wherein so  
long I haue bene snared, my first Endeavour shall be  
entierly to finishe the Treatise of that newe Science  
of manedging this newe furious Engine & rare  
Inuention of great Artillerie, in such perfe-  
ction as hitherto hath not bene in any  
language imparted with any  
Nation of Europe.

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VIRESCE VVLNERE VIRTVS.

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